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See page 22

HANNA ENGINEERING WORKS

In This Issue

Tool Engineers Meeting to Attract Thousands
See Page 10

Tool Materials and Their Treatments at Ford Motor Company

Jigs and Fixtures Design, Their Design and Construction
See Page 19

Processing Cylinder Bores Part II

SEPTEMBER
1938

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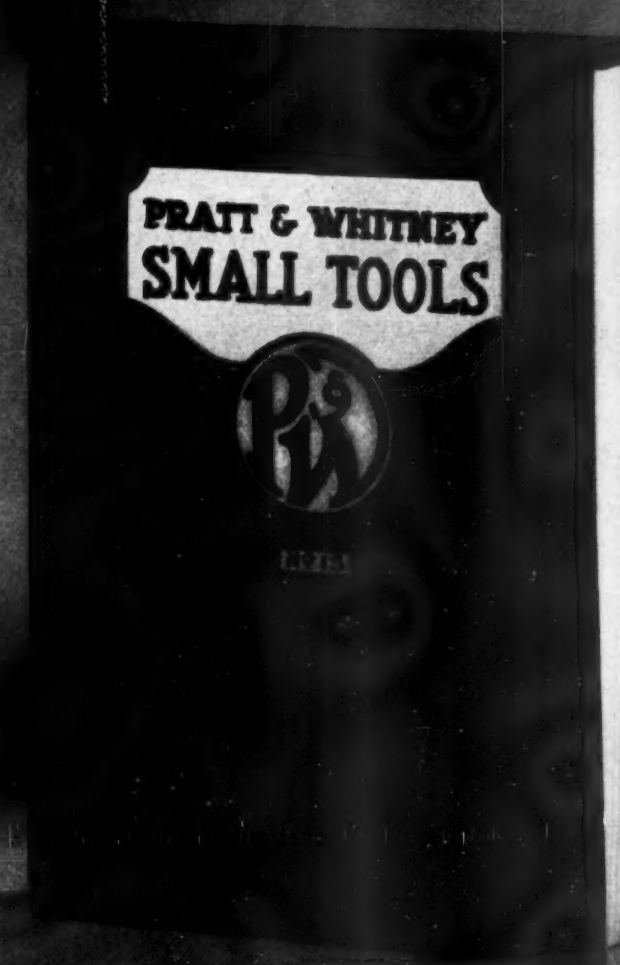

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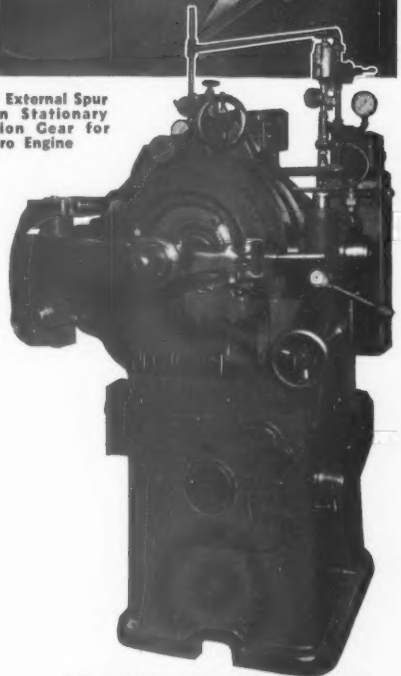

Fellows LS-type Gear Lapping Machine Arranged for Lapping Spur Gears

The Tool Engineer

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Official Publication of the AMERICAN SOCIETY OF TOOL ENGINEERS

Vol. VII SEPTEMBER, 1938 No. 5

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Owing to the nature of the American Society of Tool Engineers, a technical organization, it cannot, nor can the publishers be responsible for statements appearing in this publication either as papers presented at its meetings or the discussion of such papers printed herein.

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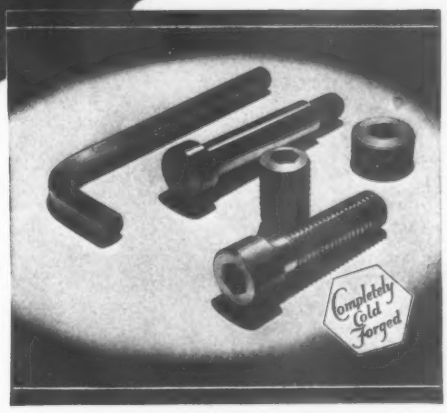

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Norton Universal
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LET Norton engineers study the flat and cylindrical parts in your assemblies that must be held within close dimensional tolerances or that require an exceptionally fine finish for close running fits without appreciable wear.

Norton Lapping engineers who are specialists in such problems may be able to suggest a combination of grinding and lapping operations that will actually reduce your present costs while improving the product.

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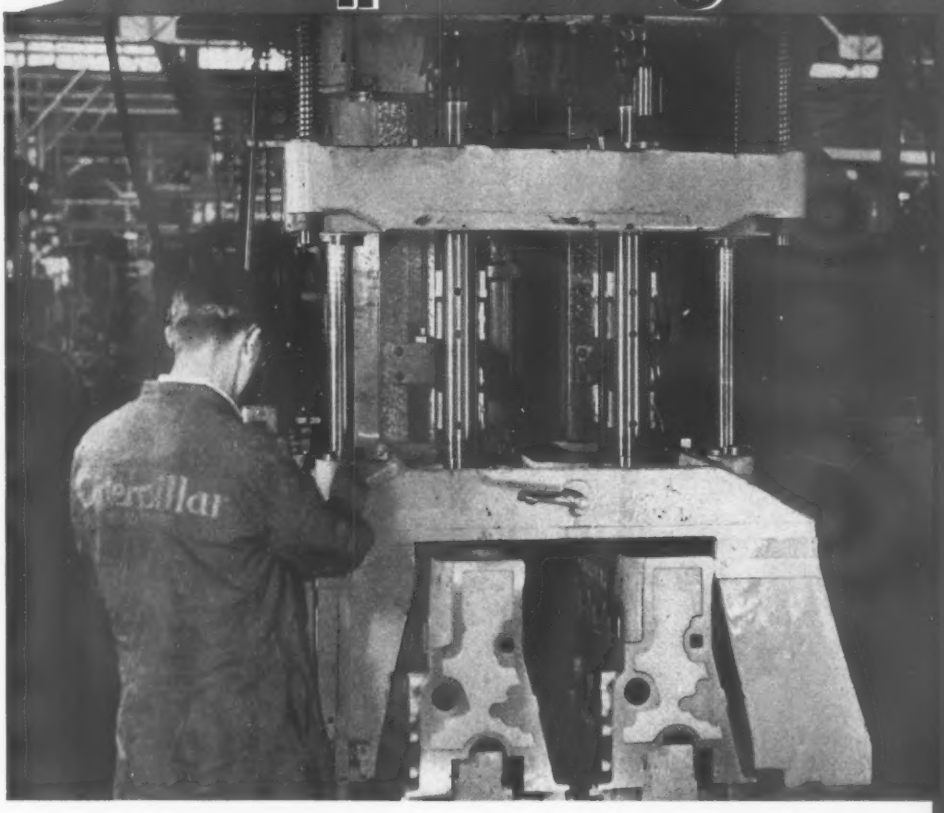
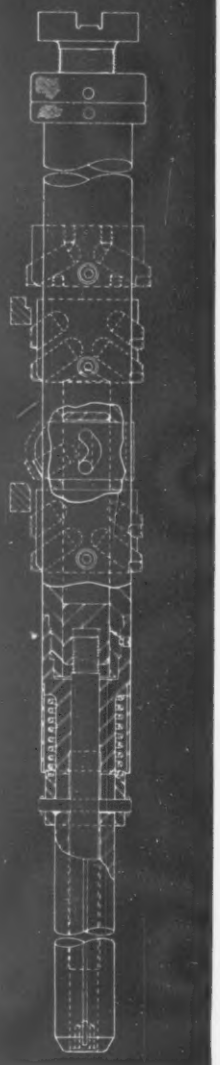
4 Distinct Types of Operations in this 1 DAVIS Block Type Boring Tool!





The diversified application of Davis Block Type Boring Tools is admirably illustrated in this interesting set-up. Here, these specially-designed tools are boring "Caterpillar" Diesel Engines complete for cylinder sleeves—rough bore, finish bore, counterbore, and inside chamfer—all in one operation!

Outstanding among the block type cutters in this tooling, is a unit for inside chamfering. This cutter is automatically expanded and contracted by means of an inner plunger bar, and is of the disappearing type. Multiple cutter blocks are also featured, to rough and finish bore. Tungsten Carbide tipped cutters are used.

If *you* have an *unusual* boring job—a particularly *hard* boring job—a *too-high-in-cost* boring job—it will pay you to find out just what Davis Block Type Tools could do for you.

Send us prints of your work and, without obligation, we will submit you a helpful, specific recommendation.

New Block Type Tool Booklet Free on Request

DAVIS BORING TOOL DIVISION

Larkin Packer Company, Inc., St. Louis, U. S. A.

DAVIS BORING TOOLS

Hannifin 16-ton hydraulic press at Wright Aeronautical Corporation plant, Paterson, N. J., pressing-in and burnishing bronze connecting rod bushings. Proper fit is indicated by the pressure required to press the bushing to position.

THIS Hannifin 16-ton hydraulic press was designed to handle various pressing and assembly operations rapidly and conveniently. The ram moves either up or down when the operator holds down either right or left side of the foot pedal. A spring return centers the operating valve in neutral when the foot pedal is released. The pump idles at zero pressure between ram movements. This simple control makes handling easier, with consequent increased production.

Bulletin 41 gives specifications of many types of Hannifin hydraulic presses. A copy will be sent upon request.

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Specifications: Stroke 21 in., table to ram (up) 22 in., center of ram to face of frame 9½ in. Table 16 x 20 in. Speeds: power stroke 60 in./min., return stroke 96 in./min. Built-in motor driven hydraulic power unit. All welded steel frame. Specifications may be modified to suit individual requirements.

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HANNIFIN

HYDRAULIC PRESSES

Good Tools Promote Industry

AN EDITORIAL

By A. E. RYLANDER

SAID an industrialist, during a recent conversation: "About ten percent of manufacturing concerns make money, some forty percent waver in the black, the balance waver toward the red or fail. And the secret of success lies in good management." Admitted—with one qualifying clause: Good management, plus good Tool Engineering. A good captain brings a liner safely to port, but he doesn't do it all by himself; there is a staff of officers whose roles may be minor but whose place in the scheme is highly essential. In the same sense, management of industry charts a course of procedure, but on Tool and process Engineers is devolved the task of seeing that manufactured goods are produced at a profit.

And, the burden of responsibility placed on Tool Engineers is becoming heavier, more complex, as modern products are refined for aesthetic appeal as well as for greater utilitarian qualities. And, to make matters worse, we face a shortage of skilled craftsmen; the young man in the tool room is becoming a rara avis, and when the old timers pass on the problem will be not so much to design tools as to have them made. All this presages new methods of producing tools, and the signs of change are already apparent. We are entering into an age of intensive specialization; despite that, tooling will progress, will set the pace for industry. Tool Engineers, facing tougher problems, will effect solutions.

That is one phase of mass manufacture that has been rather overlooked, that Tool Engineers set the pace, are the vanguard of the industrial army. True, visionaries project for the morrow and product engineers design creations of exquisite beauty, but then there is stalemate; industrial progress is halted until Tool Engineers devise means of production. We might state that in terms of past tense; today, with cumulative experience, with tooling being reduced to a precise science, the Tool Engineer anticipates future trends, prepares in advance for the manufactured commodities of the morrow.

"Yes, that tool looks promising," one of the boys remarked, as he watched an advanced design being tried out. "I hope it stands up in practice—but it will. Oh, a few bugs, perhaps—we're none of us infallible, and you know what this game is. Speed!—get it off the board and into the tool room. And out of the tool room into production before the last screw is tightened. But what the heck!—that tool is already obsolete, and if I were only sure what next year's model was going to be like I'd design one that'd do the whole set of operations in one setting. And I have a strong hunch of what's coming."

That, in epitome, portrays the frame of mind of the modern Tool Engineer. He sees coming trends with uncanny prescience,—prepares! He is critical of weight and cumbersomeness, foresees lighter tools and equipment made possible by developments in alloys, forces the metallurgist to provide metals that combine strength with lightness. He foresees pre-treated steels, forces advanced methods of cutting and finishing, envisions an ultra-precision undreamed of even a decade ago. Tools!—better tools, faster, easier on the operators, tools productive of a greater output at a lesser cost. Oh, it's a great game, a game for men who can take it, who are not afraid to try the impossible. But the Tool Engineer has deleted that word from his vocabulary, now, if an objective is worthwhile, if the means show promise of a practical end, someone will find a way to do it. That someone is the Tool Engineer. Yes, good management steers the course of industry, but good tools insure its safe arrival—at the profit side of the ledger.

An aerial view of a section of Pittsburgh's industrial area and the New Kensington Works of the Aluminum Company of America. The plant of the Aluminum Cooking Utensil Company may be seen in the foreground, and the Aluminum Research Laboratory is shown in the right-hand background of the picture—identified by the tall white stack. Among the many points of interest to be seen in these plants are the hot mill for rolling aluminum sheets, polishing aluminum, drawing aluminum for various and intricate shapes, spinning aluminum, extruding aluminum channels, bars, etc.

Tool Engineers' Meeting To Attract Thousands

Pittsburgh is scene – October 14 and 15

TOOL ENGINEERS of the nation are enthusiastically looking forward to the Semi-Annual Meeting of the American Society of Tool Engineers to be held at Pittsburgh, October 14 and 15. Reports received at National Headquarters in Detroit indicate that the get-together of the country's manufacturing executives will vastly exceed all expectations and it is anticipated, now, that the response from the membership of The Society and other interested mechanical men will be proportionately as great as the recent Machine and Tool Progress Exhibition held in Detroit last March.

From the twenty-two industrial centers throughout the country where The Society has branch chapter organizations, reports indicate that the local groups have received the idea of the get-together and opportunity to visit the outstanding industrial plants of the Pittsburgh area with considerable favor. Special committees in the twenty-two chapters are arranging for "all expense" trips, or special transportation rates from the chapter city to Pittsburgh and return. Special trains, special cars, specially chartered buses for the more nearby points, room accommodations ranging in price from $1 to $5 per day have already been arranged for. The purpose of all these committees working in co-operation with the national offices of The Society is to provide a two-day convention for the country's production executives at a minimum of cost, packed full of entertaining, instructive opportunities to see and learn about the Pittsburgh industries, as well as to participate in live technical sessions, and to hear speakers of national importance.

Plans for the Semi-Annual Meeting have been progressing rapidly since the first announcement of this meeting which appeared in the last issue of this publication. Some chapters in certain sections of the country have announced plans whereby special cars will leave the chapter city traveling toward a central junction point where other special cars from other chapter cities nearby will make up a complete train to continue on its way to Pittsburgh. This will afford a splendid opportunity for Tool Engineers of the same section of the country to meet and join in mutual exchange of ideas and to renew old friendships, as well as to meet and mingle with other Tool Engineers from the more remote sections of the country while in session at Pittsburgh.

★ ★

Come to Pittsburgh for a Big Time and See and Learn About Many of the Nation's No. 1 Plants

• • •

Some Facts You Should Know

Pittsburgh has the WORLD'S LARGEST—manufacturers of aluminum, air brakes, steel rolls, plate and window glass, plumbing fixtures, bolts, nuts and rivets, largest stainless steel company, world's largest tin plate mill, world's largest manufacturer rolling mill machinery, and many other great plants too numerous to mention.

Pittsburgh's (Metropolitan area) Population is 1,953,668

Has a civic center costing more than $100,000,000 represented in magnificent structures constituting the most striking architectural group in America.

Cathedral of Learning—only skyscraper schoolhouse in the world—41 stories, 535 feet high—one of the most beautiful Gothic buildings ever constructed.

Stephen C. Foster Memorial Theatre and Shrine, containing the Josiah K. Lilly collection of Fosteriana, which includes 185 original manuscripts and first editions.

Finest location as to accessibility for the greatest number of people. Two-thirds of the population of the United States and one-half of the population of Canada can reach Pittsburgh overnight by train.

Room Accommodations from $1.00 to $5.00 Are Available

Members of A.S.T.E. and Tool Engineers contact chapter officers for full details as to transportation, costs, etc.

★ ★

PROGRAM

A.S.T.E. Semi-Annual Meeting, Pittsburgh, October 14, 15, 1938.

October 14

9:00 A.M.—Registration — Wm. Penn Hotel (Convention Headquarters).

9:30 A.M.—Plant Tours (Leave Wm. Penn Hotel by bus or special train to plants to be visited. Selection to be made in advance.)

Plants to be visited:

Aluminum Company of America
Firth-Sterling Steel Company
Heppenstall Company
Mesta Machine Company
Mellon Institute
U. S. Steel Company
Westinghouse Electric & Mfg. Company

4:30 P. M.—Return from plant tours.

6:30 P. M.—Semi-Annual Dinner, Wm. Penn Hotel — Chatter Box Room.
Principal Speaker—J. H. Van Deventer, Editor "The Iron Age."
Subject—"Tools, Taxes and Wages."

8:00 P. M.—Semi-Annual Meeting and Technical Session.

October 15

10:00 A.M.—Technical Session, Urban Room, Wm. Penn Hotel.
Speaker—L. W. Chubb, Westinghouse Elec. & Mfg. Company.
Subject—"Industrial Advancement Through Scientific Research."

10:00 A.M.—Directors' Meeting, Parlor E.

2:00 P. M.—Industrial talking motion pictures, Urban Room, Wm. Penn Hotel.

Nationally Known Plants to be Visited Offer Many Splendid Opportunities to View Varied and Interesting Manufacturing Operations

Of all the plants which have thrown their doors open to the visiting Tool Engineers during this Semi-Annual Meeting, it is difficult to determine which plant will offer the biggest attraction. Some of the production executives may choose to see the large scale operations of the huge Westinghouse Electric and Manufacturing Company's plant in East Pittsburgh, others will choose the mammoth operations in the fabrication of steel mill equipment to be seen in the Mesta Machine Company's plant, while many others undoubtedly will make their first choice the New Kensington Works of the Aluminum Company of America, one of the largest works of its kind in the world where aluminum and aluminum alloy, both sheet and strip, as well as plate, are manufactured in the rolling mills there for use in many diversified industries.

A visit to the Heppenstall plant will afford a splendid opportunity to see at first hand this large company's facili-

(Continued on page 38)

RHAPSODY OF THE ARC

Like a player on the keyboard of a mighty organ, these hands are checking "De-ion" arc extinguishers developed at the East Pittsburgh works of Westinghouse Electric and Manufacturing Company. These arc "quenchers," by a series of slotted plates, break up the balance of ions necessary for a flow of current, extinguishing an arc in one one-hundredth of a second. Another of the interesting features to be seen on the various plant tours during the A.S.T.E. meeting.

Photo Courtesy Aluminum Co. of Am.

Typical of the heavy machinery fabricated by the Mesta Machinery Company, one of the Pittsburgh plants to be visited by Tool Engineers at the A.S.T.E. Semi-Annual Meeting, is the Mesta five-stand tandem cold mill for rolling tin plategages, pictured above.

Tool Materials and Their Treatments

in the Ford Motor Company

By F. C. YOUNG
FORD MOTOR COMPANY

WE USE about 20 types of steels and alloys in our various types of tools, dies, trim and shear blades, broaches, etc.

For tool bits for Bullards, lathes, milling cutters, hobs, etc., we generally use the 18-4-2 type of High Speed Steel (see table of analysis) properly forged and hammered — as we term it — and either single or double heat treated as follows: Preheat to 1450° F., superheat to 2300° F., air cooled; again preheat to 1450°-1500° F., superheat to 2350°-2400° F., oil quench then draw at 1050° F., or approximately 3 hours air cool, and again draw at 1050° F. for 2 to 3 hours. —Rockwell Hardness C-63-65. This treatment is specified on blue print when recommended by the laboratory and usually after tests have been conducted proving its merits.

Hammering of High Speed Steel. By this is meant bars are upset and then forged, repeating this about six times so that the steel has had a thorough working. This disperses the carbides throughout the steel. Forging temperatures are held closely at 1950°-2000° F. Sections are heated slowly and uniformly to desired temperature and forged under a 2500 pound or heavier hammer. Finishing temperatures are about 1800° F. Forgings are then placed in furnace held at 1650° F. and permitted to cool with the furnace to 1100° F. Forgings are then reheated to 1550° F., and again slowly cooled in furnace to 1000° F. These forgings are now properly annealed, and ready for machining.

Drills

Most of the drills used for steel parts are made of the 18-4-1 type High Speed Steel, as this steel is somewhat tougher because of the lower carbon. The Molybdenum type of high speed steel is also used quite extensively for drills. Great care must be exercised in heat treating this type of steel as the Molybdenum is readily volitilized in heating, known as Demolybdinizing.

Several methods are used to overcome this in hardening. First heating in a salt bath, second heating in controlled atmosphere furnace and third coating parts with borax.

Molybdenum High Speed Steel is also being used for a number of other purposes as tool bits for lathes, Bullards, milling cutters, gear cutters, broaches, etc. The analysis of this type steel used by Ford Motor Company is given in table under Molybdenum High Speed Steel. The heat treatment is preheat to 1500° F., super to 2175°-2200° F., quench in oil. Draw at 1040° F., or 3 hours minimum. Rockwell hardness C-63-65.

For a number of cutting operations Stellite—which is a cast metal composed principally of tungsten-chromium and cobalt—is used. This will outlast the general run of high speed steel for cutting such metals as cast iron. This metal is considerably higher in cost than the high speed steel but in performance is so much better that the cost per piece cut is less than with high speed steel. This is likewise true of the tungsten carbide cemented type of tools. The cost per pound of this material is relatively expensive. Of course, only small tips weighing from several grams to as much as 25-30 grams are used but these tools are still very costly per piece. However, when one considers the number of pieces which can be cut per tool grind the cost becomes a small part. An example is provided by work on the Lincoln cylinder block. On the roughing operation Stellite blades were changed every 8 hours. Tungsten carbide ran a total of 400 hours. On the finish operation Stellite cutters were giving 8 to 16 hours per grind, whereas the tungsten-carbide on the finishing operation ran from December 22nd to April 8th or a total of 720 hours running time. The cost of tungsten carbide blades is 26% above stellite and the first run of tungsten carbide is equal to two complete sets of Stellite blades, with no lost time for changing of cutters, or loss of production.

Miscellaneous Tools

Such tools as hand chisels, air gun chipping chisels, bull points, concrete busters, drifts, etc., are made from our type "CC" steel (see table of analysis). The heat treatment for this part is: heat to 1525° F., quench in caustic solution draw at 350° F. Rockwell C-56-59.

Chipping chisels used in chipping billets in steel mill are forged to shape on the gun end and cutting points (eliminating all machining), and heat treated on both ends for a distance of three inches to a Rockwell of C-56-59. This hardness on the gun end is necessary to prevent mushrooming which makes it difficult to remove the chisel from the gun and to obtain maximum resistance to fatigue action at the point of pressure while operating.

Hand chisels are hardened on the cutting end only (about 2½" from the point). The other end is soft because we prefer that it mushroom rather than chip as chipping might cause injury to the workman.

Rivet busters and concrete tools are heat treated similar to billet chipping chisels. Forgings temperatures are held within 1800°-1900° F. The cutting qualities of this material are excellent and if care is exercised in grinding the cutting edge, when they become dull, they can be ground six times before reforging.

Cold-Heading

The majority of cold heading tools are made of straight carbon tool steel, our type "RR STEEL" (see table of analysis). As some operations are inherently more difficult than others, it is necessary to use hammered tool steel. For operations still more difficult, alloy steels must be used.

All upset punches are made from straight carbon tool steel and heat treated to Rockwell 52-54. Heat to 1450° F., quench in brine or water, draw at 600° F. They are quenched in fixture so as to get uniform hardness on the working part of the punch, which is generally a hole or recess. The Rockwell hardness of an upset punch is lower than that of a finish punch because the work it performs requires more toughness than hardness.

All thread roll dies are made from chrome non-shrink steel (see table of analysis). Heat treated as follows: preheat 1250° F., superheat to 1850° F., cool in air, drawn at 550° F. Rockwell 58-60. Heat treating is done in atmosphere controlled furnace. Dies must be kept absolutely clean because serrations are not polished or ground after heat treating. The above Rockwell hardness must also be maintained as this has been found to be the best hardness. If dies are made harder thread serrations will chip and break on rolling. If made softer, thread serrations will flatten and eventually break.

Number of pieces produced per thread die is dependent on size of threads rolled. Nevertheless our production ranges from 500,000 pieces to 1,000,000 pieces per set of dies.

Hot Heading Tools

The majority of hot heading tools are made from either Ford hot work steel, insert die steel, or Ford hot work steel with Stellite weld.

All form dies are made from Ford hot work steel (see table of analysis). The heat treatment is: heat to 1620° F., quench in oil, no draw. Brinell 321-340.

This material is used on form dies for hot upsetting such parts as the torque tube flange, driving pinion, transmission gears. One advantage is that worn out dies can be sent directly to be reworked as they are machinable at 340 Brinell hardness. This saves cost of annealing and hardening between reworks.

On forms more difficult to upset, insert die steel is used (see table of analysis). The heat treatment for this is: pack

STEEL ANALYSIS CHART

Type	Carbon	Manganese	Chromium	Silicon	Phosphorus	Sulphur	Tungsten	Vanadium	Molybdenum	Nickel
AAA	.30- .35	.65-.80	.90- 1.10	.10-.20	.03 Max	.04 Max				
Chrome Non-Shrink	1.45-1.60	.25-.35	11.00-12.00	.20-.40	.03 Max	.04 Max		.20- .25	.70-.90	
CC	.44- .50	.40-.55	.70- .90	.15-.25			1.00-1.20			
Die Block Hammer	.47- .55	.50-.60	.60- .75	.10-.20	.03 Max	.04 Max				1.50-1.75
Ford High Speed Steel (Taps & Drills) 18-4-1	.65- .73	.25-.35	3.75- 4.25	.20-.30	.03 Max	.04 Max	17.0-18.0	1.00-1.25		
Ford Hot Work Steel	.18- .23	.40-.60	1.40- 1.60	.15-.25	.04 Max	.04 Max			.45-.55	
Ford Spec. High Speed 18-4-2	.78- .84	.25-.35	4.00- 4.50	.20-.50	.03 Max	.04 Max	18.0-19.0	2.00-2.25	.50-.80	
R	.70- .80	.20-.35	.10 Max	.15-.25	.025 Max	.03 Max				
RR	.95-1.05	.20-.35	.10 Max	.15-.25	.025 Max	.03 Max				
Tap Steel (Under 1" Dia.)	1.20-1.30	.25-.40	.35- .45	.30-.45	.025 Max	.025 Max	1.25-1.50	15.25		
Insert Die Steel	.55- .60	.45-.60	.70- .80		.03 Max	.04 Max			.75-.80	2.25-2.45
Vanadium Tool Steel	.95-1.05	.20-.35	.10 Max	.15-.25	.025 Max	.03 Max		.40-.50		

The examples listed here are by no means a complete list of steels and heat treatments used by the Ford Motor Company, but merely representative of a few examples of some of the classes of steels with their treatments which may be used as a guide for similar types of work.

and heat to 1620° F., cool in fan blast, draw to suit job.

This material is used to form such parts as billets for spindles, steering sector shaft, rear axle driving gear, etc. The sizes and shapes of some of these dies permit them to be made by the die-typing method. This saves a tremendous cost of die manufacture. Because of these sizes and shapes it would be uneconomical to rework the dies, therefore a better steel is used to obtain maximum production in one run. A number of our dies are made by our method of die typing.

This is a method wherein a master form is used to make impressions in the hot block which becomes the die. The top of the die is then faced off to the proper depth of the impression, and the impression is cleaned by grinding and polishing. When used as an insert this is then shrunk into a large block which forms the complete die block. These operations require close temperature control and supervision to obtain the required results. An extended paper on our experience with die typing was published in a technical journal in June, 1934.

Most piercing punches are made from Ford hot work steel welded with No. 6 Stellite about 2½" from the working end. This has increased tool life as high as 1000% on some operations. Punches can be reworked and used again. In some cases a punch is worn out about an inch from the working end only. In this case the Stellite on this worn-out part is ground out and rewelded. Too many reworks of this kind or abusive grinding cause cracks. When this occurs, all Stellite is ground off; then the punch is rewelded. The body of the punch can be used indefinitely; this saves a tremendous cost of making punches.

All cut-off blades are made from Ford hot work steel welded with Stellite. This also increased tool life tremendously. Nearly all the cut-off blades can be reworked and used indefinitely.

All hot heading upset punches are made from Ford hot work steel. On more difficult operations, the punches are water quenched and made still harder. Brinell 387-418. For regular performance we use the same heat treatment except that the punch is quenched in oil to Brinell 340-364.

Hammered Forgings

At present two types of hammer die blocks, the solid and inserted types are used by the Ford Motor Company. The solid type has a machined form while the inserted kind has the typed form or die.

We will first discuss the solid type or hammer die. The reason for using a solid die is that the part to be forged is too large to be inserted and the insert surrounded with enough steel to withstand the impact of the steam hammer.

These dies are made from Ford hammer die block steel (see table of analysis). This material is forged at 2150°-2200° F., and allowed to cool slowly in furnace to 800° F, it is then reheated to 1650° F. and cooled in air to a Brinell 196. Three-eighths of inch is machined from the face of the block and then the block is heat treated as follows: Face covered with charcoal, heat slowly to 1450° F. (1½ hours per inch cross-section), quench in oil, draw at 850° F. Brinell 364-387. The solid hammer die is used exclusively in the Ford plant for forging the front spindle. It produces between 2500 and 3000 forgings per run. The dies can be reworked an average of three times.

Inserted hammer dies consist of two parts, the adapter which holds the insert and the insert itself. The adapter is made from Ford type "AAA" steel (see table of analysis). It is forged at 2250°-2300° F. and annealed at 1650° F., cooled in air to give a Brinell of 179-196. After forging the adapter is given the following heat treatment: heat to 1500° F., quench in caustic solution, draw at 950° F. Brinell 286-340. It is then machined all over, including a recess for the insert. A three-inch wall around the recess is necessary for the die to withstand the impact of the steam-hammer.

The insert is made from Ford insert die steel. This material is forged at 2100°-2150° F., and annealed at 1650° F. cool in air, it is then reheated to 1350° F. and cooled in the furnace at 1000° F. Brinell 207-241. The form is forged by the die typing method and immediately annealed as above. The form is then polished, the sides and

(Continued on page 32)

PROCESSING CYLINDER BORES

By KIRKE W. CONNOR
PRESIDENT
MICROMATIC HONE CORPORATION

Part II

(Continued from August issue)

Operations Used in Process

AN ANALYSIS of production, based on new passenger car registrations, shows that there are apparently six combinations of processing operations in common usage at the present time in the United States, comprising groups of four, five, and six operations for the production of engine cylinder bores, as shown in Fig. 4. As shown in Chart 1, three manufacturers are using two boring, one reaming, and one honing operation. The removal of .003" stock in a single honing operation required a fairly coarse grit size, producing a final surface finish which is below the average favored by the industry.

The combination of three boring operations and a single honing operation shown in Chart 2, is used by two manufacturers at the present time. The left-hand graphs in each type of process represent the amount of stock removal which has been found necessary in each operation in a block which is cast with atmospherically poured Ni-Chrome iron in wet sand moulds.

The right-hand graphs in each type of process, illustrate the current practice used in processing another block, made of the special iron and cast with the special technique previously mentioned. This practice has resulted in considerable reduction of stock removal.

In the group of manufacturers using combinations of five operations, nine are represented in Chart 3. The average of two typical plants is shown. Chart 4 shows another combination of five operations used by one manufacturer, comprising three boring and two honing operations.

Combinations of six processing operations are being used by two manufacturers as shown in Chart 5. The first plant in this group uses three multiple point boring operations, followed by one reaming and two honing operations.

The second manufacturer in this group processes cylinder bores as shown in Chart 6.

The recent development of hydraulically actuated honing tools creates a new advancement in economical production processing. These tools are now being used in several installations to accomplish large amounts of stock removal at a rate from three to four times faster than was ever possible with mechanically actuated tools. These installations have proven that it is practical to use this new development of the honing method for the purpose of substantially reducing the number of preparatory operations, and raising the standard of accomplishment as related to the degree of finish produced.

As a result of the installation of these tools in one high-production plant, the reaming operation is being eliminated. With the heavy stock removal obtained with hydraulic actuation, it is indicated that future processing may follow the trend toward the simplified and more economical processing comprised in the group of four operations shown in Chart 7, consisting of two boring and two honing operations. Using this combination on present castings made of atmospherically poured Ni-Chrome iron in wet sand molds, it is conceded that a stock removal of approximately .165" would be required by rough boring, .060" by semi-finish stub bar boring, .006" to .008" by rough honing, and from .0007" to .001" by finish honing.

Indicating the practicability of this method, the processing now used by one manufacturer of the wet type of tractor sleeves is shown in Chart 8. Prior to the adoption of hydraulic honing tools, these sleeves, which are 5¾" diameter by 15" long, were rough bored, hardened, rebored, rough honed, and finish honed with mechanically actuated honing tools—a total of four operations. With the use of hydraulic honing tools this processing was reduced to three operations as follows: Rough boring removes .250" stock. The sleeves are then heat treated to 45-50 Rockwell C scale, which produces out-of-roundness varying from .008" to .018". Hydraulic honing tools then remove an average of .027" stock in a rough honing operation at the rate of .010" per minute, generate accuracy while correcting all distortion and controlling diameter size. This is followed by a secondary finish honing operation, removing .001" stock for securing final size and surface finish. This combined

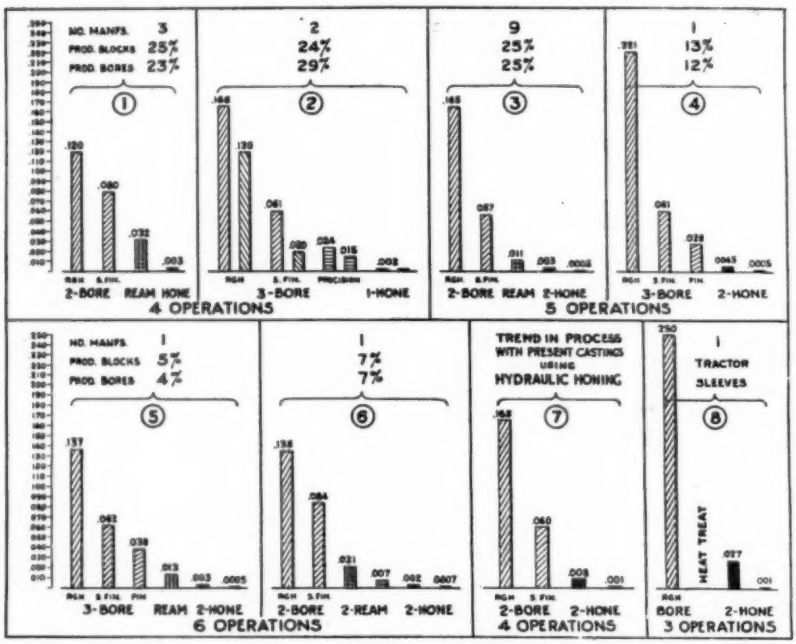


Fig. 4—Left, Classification of Processing Operations.

Fig. 5—Below, Final Surface Finishes Used in Production.

TOTAL NO. OPERATIONS	4	
STONE GRAIN USED	280	400
NO. HONING OPERATIONS	1	1
TOTAL STOCK REMOVED-HONING	.003	.002
SURFACE FINISH-MICROINCHES	20-30	9-13
NO. MANUFACTURERS USING	2	3

TOTAL NO. OPERATIONS	5		
STONE GRAIN USED	320	400	500
NO. HONING OPERATIONS	2	2	2
TOTAL STOCK REMOVED-HONING	.0035	.0035	.0035
SURFACE FINISH-MICROINCHES	11-15	9-13	7-10
NO. MANUFACTURERS USING	1	3	3

TOTAL NO. OPERATIONS	6	
STONE GRAIN USED	220	400
NO. HONING OPERATIONS	2	2
TOTAL STOCK REMOVED-HONING	.003	.0035
SURFACE FINISH-MICROINCHES	25-35	3-4*
NO. MANUFACTURERS USING	1	1

* HYDRAULIC HONING

processing produces accuracy within .0005" for roundness, and from .0007" to .001" for straightness. The O.D. is then generated from the I.D.

The fact that no center distances must be maintained makes possible the three-step processing above described. A similar degree of simplified processing would not be practical in bores cast-in-block at the present stage of multiple point boring development. This application demonstrates the large amount of rapid stock removal now possible by the honing process on tough, hard material.

A study of stone wear and stone life in this application indicates the desirability of evaluating the accomplishment in cost per cubic inch of stock removal. With former mechanically actuated tools, removing an average of .006" or approximately 1.63 cubic inches of stock per sleeve, stone cost was at the rate of 2.2c per cubic inch or 3.5c per operation. With hydraulic tools, removing an average of .027" or 7.32 cubic inches, stone cost has been reduced to approximately .5c per cubic inch of stock removal or 3.7c per operation. In other words, stone cost is reduced more than 75 per cent. Over 4½ times as much stock is now removed in each sleeve at an increased cost of only .2c per sleeve.

In another application, removing from .001" to .0015" stock, stone life has increased from 250 pieces to 650 pieces per set of stones.

Surface Finish in Process

An analysis of final surface finish as used by various manufacturers in current production is shown in Fig. 5. Recent advices received from piston ring manufacturers indicate that with the new oxidizing treatment of rings now being adopted, the best, smoothest cylinder wall finish is desirable.

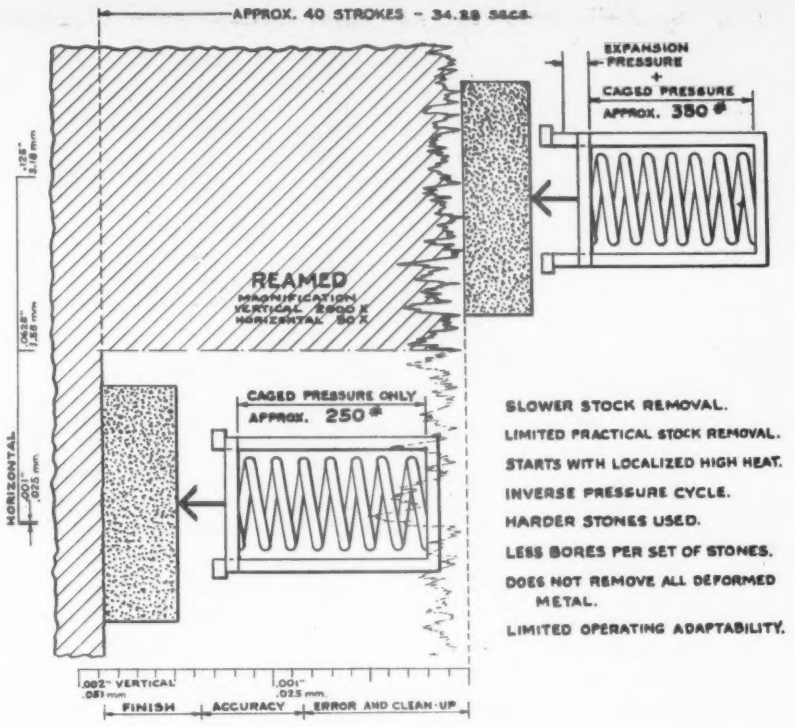

APPROX. 40 STROKES - 34.28 SECS.
EXPANSION PRESSURE + CAGED PRESSURE APPROX. 350 #
REAMED
MAGNIFICATION VERTICAL 2000 X HORIZONTAL 50 X
CAGED PRESSURE ONLY APPROX. 250 #
SLOWER STOCK REMOVAL.
LIMITED PRACTICAL STOCK REMOVAL.
STARTS WITH LOCALIZED HIGH HEAT.
INVERSE PRESSURE CYCLE.
HARDER STONES USED.
LESS BORES PER SET OF STONES.
DOES NOT REMOVE ALL DEFORMED METAL.
LIMITED OPERATING ADAPTABILITY.
.002" VERTICAL .051 mm
.001" .025 mm
FINISH
ACCURACY
ERROR AND CLEAN-UP

Fig. 7—Mechanical Automatic Actuation in Reamed Bores.

Analysis of Pressure Application

Hydraulically actuated honing tools in the above instances have demonstrated an entirely new achievement in cutting action. To analyze this result, the progress of controlled pressure applications and the manner in which they work, are traced in Figs. 6, 7, 8, 9, and 10.

In these diagrams, all drawn to the same scale, a typical profiligram has been reproduced as representative of semi-finish boring, precision boring, or reaming in cast iron bores. Also, the conventional amount of stock removal required for correction of error and clean-up, sizing, and the generation of accuracy and final surface finish is shown in the lower half of each diagram.

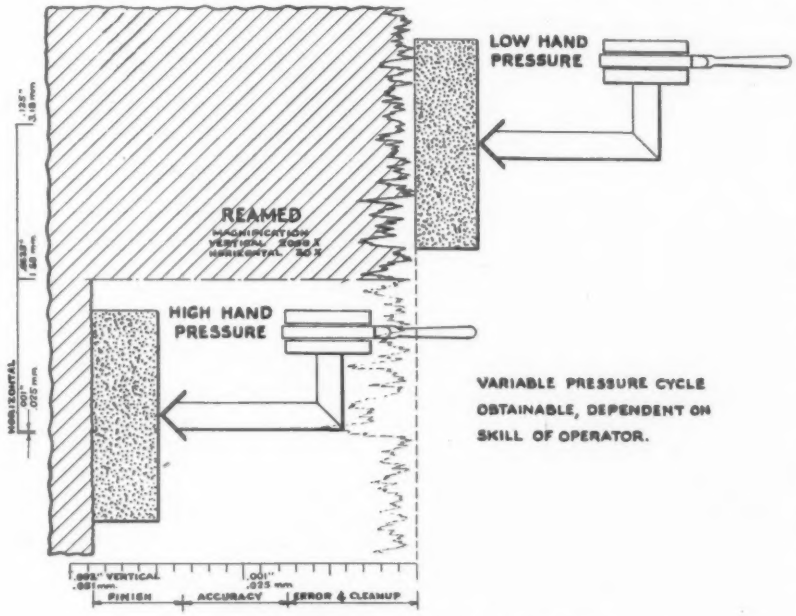


Fig. 6—Mechanical Brake Actuation in Reamed Bores.

The brake type control honing tools, shown in Fig. 6, are widely known. In this type of actuation, it is possible for the operator to start the honing operation with relatively low hand pressure, and to build up this pressure during the expansion of the abrasive members throughout the operating cycle. A skillful operator can remove approximately .006" stock per minute of actual honing time on a single spindle machine. In multiple spindle applications, the necessity for adjustment of each tool and relieving the cones usually limits stock removal in production to approximately .003" per minute. A great deal of the efficiency of this type of actuation is dependent upon the skill of the operator and his ability to maintain a correct operating pressure cycle uniformly in production.

Automatic type mechanically actuated tools, arranged with caged spring feed pressure, as shown in Fig. 7, have been developed to produce a stock removal of .003" in a cycle of 12 to 15 seconds, and yielding productions as high as 90 to 100 blocks per hour per machine. This type of actuation, however, has a maximum limit of practical stock removal, beyond which the operation loses its economical advantage. This is

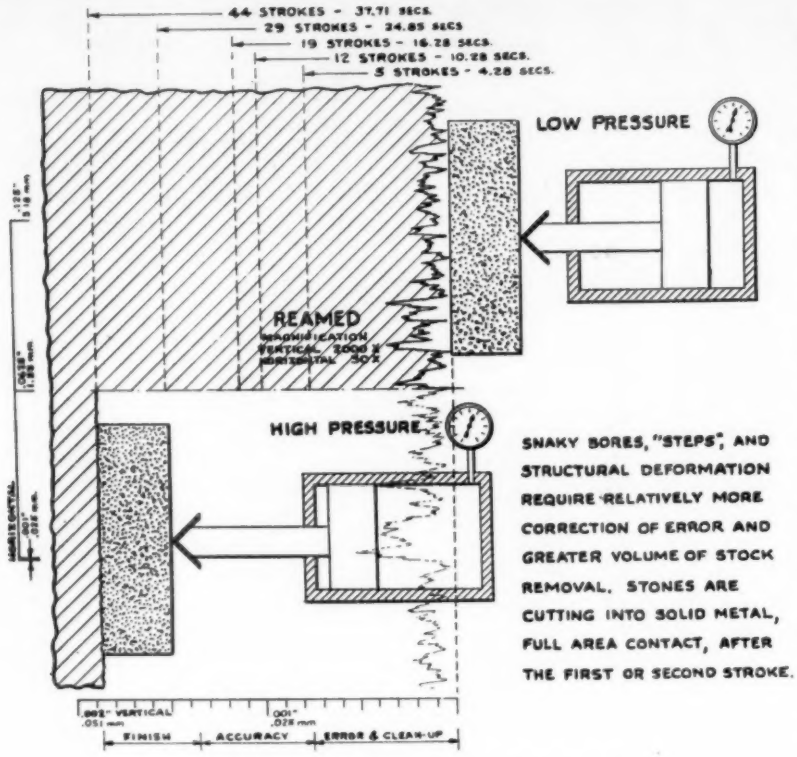

44 STROKES - 37.71 SECS.
29 STROKES - 24.85 SECS
19 STROKES - 16.28 SECS.
12 STROKES - 10.28 SECS.
5 STROKES - 4.28 SECS.
LOW PRESSURE
REAMED
MAGNIFICATION
VERTICAL 2000 X
HORIZONTAL 50 X
HIGH PRESSURE
SNAKY BORES, "STEPS", AND STRUCTURAL DEFORMATION REQUIRE RELATIVELY MORE CORRECTION OF ERROR AND GREATER VOLUME OF STOCK REMOVAL. STONES ARE CUTTING INTO SOLID METAL, FULL AREA CONTACT, AFTER THE FIRST OR SECOND STROKE.
.002" VERTICAL .051 mm
.001" .026 mm
FINISH
ACCURACY
ERROR & CLEAN-UP

Fig. 8—Hydraulic Automatic Actuation in Reamed Bores.

largely due to the pressure being applied inversely to the amount of work done. For the removal of approximately .0035" stock, an expansion adjustment is required in the tool which sets up approximately 40 per cent excessive initial pressure in the caged spring which diminishes throughout the honing cycle. This results in a decrease of pressure as the amount of work increases. This spring feed type of construction gives free cutting action for limited stock removal and is preferable in finishing operations.

The results shown in Fig. 8 were taken from a test run in one recent production installation of hydraulically actuated honing tools used for rough honing. In this test the pressure cycle was maintained at low pressure for approximately 15 strokes, then automatically increased to high pressure for the balance of the operation. It was noticed that after the first few strokes, the operation tended to bog down. This was analyzed as resulting from the variation in character of the surfaces in the bores. "Snakiness," steps, and variable structural deformation produced by reaming was found to require relatively more correction of error and greater relative volume of solid stock removal. In this operation the stones are cutting into solid metal, with practically full area contact, after the first or second strokes.

In the belief that some of these unfavorable conditions might be eliminated and greater efficiency obtained, it was decided to try a comparable method to that used in the processing of tractor sleeves previously mentioned. Using exactly identical operating speeds, pressure cycles, and stones, alternate blocks were by-passed around the reaming machines, coming to the honing machines directly from the boring operation. The result is shown in Fig. 9. Starting with low pressure for approximately 12 strokes and increasing to high pressure for the balance of the operation, approximately 50 per cent more stock was removed in approximately two-thirds the time required for processing after reaming.

In analyzing this test, it was discovered that the uniformly rougher surface and deeper scratches produced by boring serve to accomplish a desirable dressing action and maintain clean cutting faces on the stones. This permits the tools to accomplish accuracy and obtain clean-up and correction of error with relatively few strokes, following which the pressure is increased to permit solid, base metal stock removal for final sizing and finish. This accomplishment makes possible a reduction of previous processing operations, or substitution of a more economical process as a third or fourth operation. Production may be increased due to shorter total processing time. The tools are arranged with an adjustable positive stop limit of expansion which permits controlled sizing and reduction in the number of allowed sizes for selective fitting of pistons. The correct pressure cycle allows the use of softer stones to accomplish faster, free-cutting action, and produces more bores per set of stones. More favorable pressure control accomplishes cooler cutting operation, permits removal of all disturbed metal caused by percussion in previous operations, and results in finer accuracy and controlled finish which may be optionally selected by the manufacturer.

The combined processing accomplishment being obtained by one manufacturer is shown in Fig. 10. This manufacturer uses the iron analysis containing copper, previously mentioned. Approximately .0015" to .002" stock is removed, with hydraulic honing tools in one operation using 400 grit stones, and producing a gray finish. The reduction in stock removal made possible by the

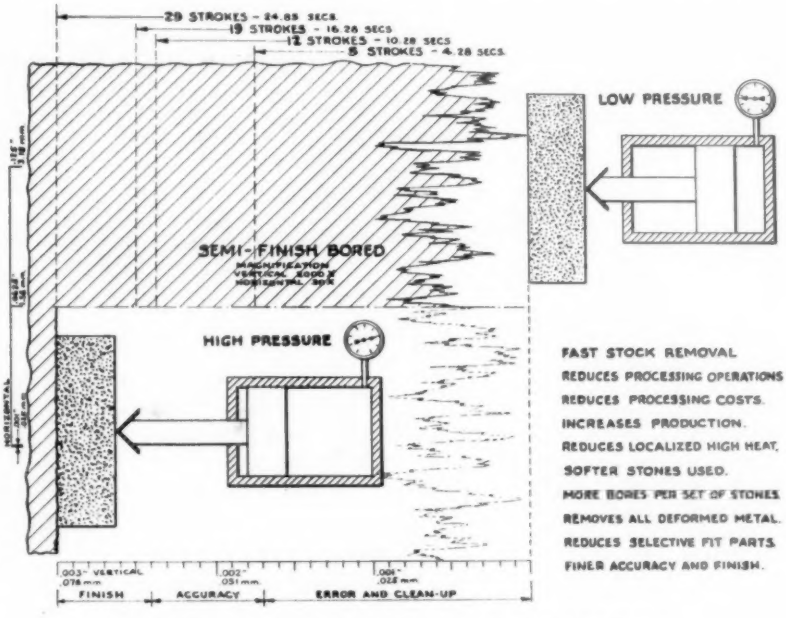


Fig. 9—Hydraulic Automatic Actuation in Semi-Finish Bored Cylinders.

use of this special iron and combined processing is still sufficient to require a grit size which limits the accomplishment in final surface finish to approximately 8 or 9 microinches in production. It is indicated that a mirror finish would require two honing operations, with a finer grit being used for finish honing.

Fig. 11 visualizes the combined processing used in the plant producing this accomplishment. Rough boring, comprising the use of four-blade, piloted bars with stellite tipped cutters, removes approximately .120" on the diameter, producing a surface for which the profilometer reading ranges from 150 to 200 microinches.

Semi-finish boring, using three-blade stub bars with Carboloy-tipped cutters, removes .020" stock on the diameter, for which the profilometer reading is approximately 150 microinches.

In the precision boring operation, single point Carboloy-tipped cutters remove .015" stock, producing a surface with profilometer reading of 60 microinches.

A single honing operation, with hydraulically actuated honing tools, removes from .0015" to .002" stock on the diameter, producing accuracy within .0003" to .0005", and with final surface finish profilometer reading of 8 microinches.

This particular application is notable for the reduction of total stock removal which has been obtained with the combined development of special iron, special casting, and controlled temperature machining.

Typical Installations

The production line in one plant is shown in Fig. 12, showing hydraulically actuated honing tools for the rough honing operation installed on the first and third machines, counting from the right-hand side of the picture. A close-up view of this equipment is shown in Fig. 13, and includes the electric timer which is used to effect automatic increase in the pressure cycle in accordance with operating requirements.

Fig. 14 shows a recently developed single-spindle all-hydraulic honing machine as used by a manufacturer of replaceable sleeves for tractor motors. A close-up view of this machine and tool equipment is shown in Fig. 15, including a two-station fixture which is used to obtain more rapid production.

Conclusion

It seems to be unanimously agreed that at least two boring operations are required to generate accurate alignment in cast-in-block bores. Simplified processing must therefore be obtained with increased mechanical accomplishment in multiple point boring operations, and the improved processing technique now available in the finishing operations. This is suggested by experience with limited production, third boring operations in some present installations. Evaluation of high speed spindle precision boring applications on cast-iron cylinder bores, using tungsten carbide-tipped cut-

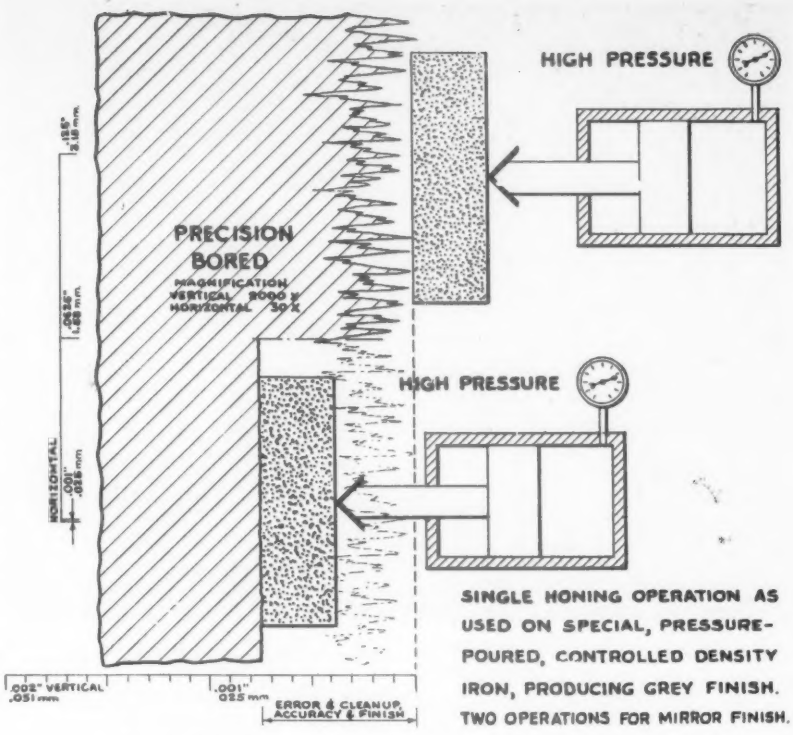
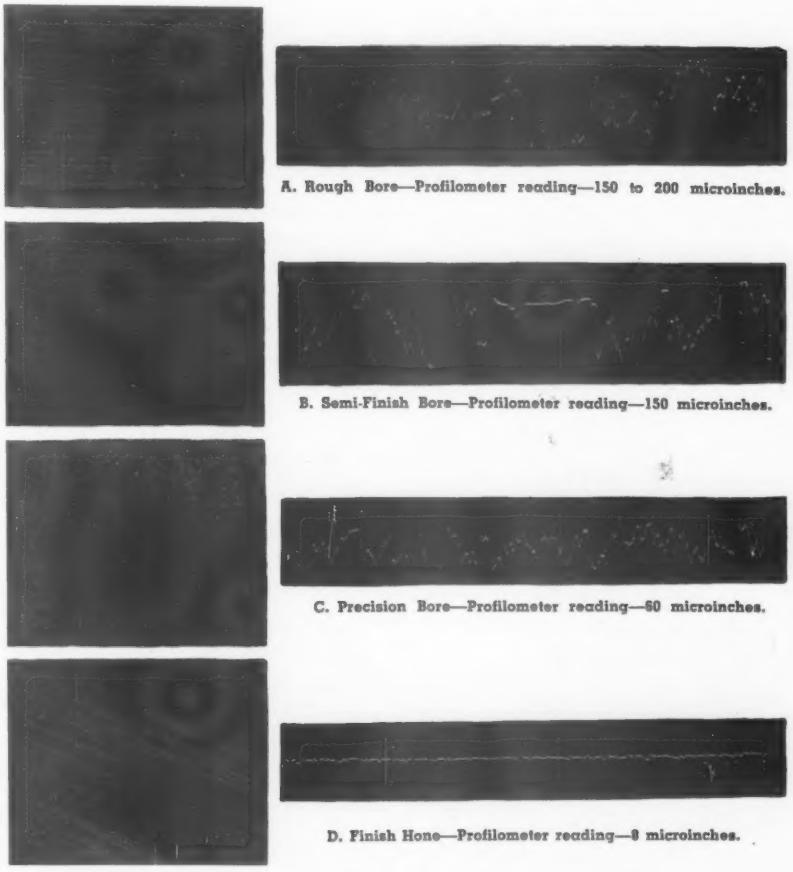


Fig. 10—Hydraulic Automatic Actuation in Precision Bored Cylinders.



A. Rough Bore—Profilometer reading—150 to 200 microinches.

B. Semi-Finish Bore—Profilometer reading—150 microinches.

C. Precision Bore—Profilometer reading—60 microinches.

D. Finish Hone—Profilometer reading—8 microinches.

Fig. 11—Surface Roughness after Machining Operations in Cylinder Block.

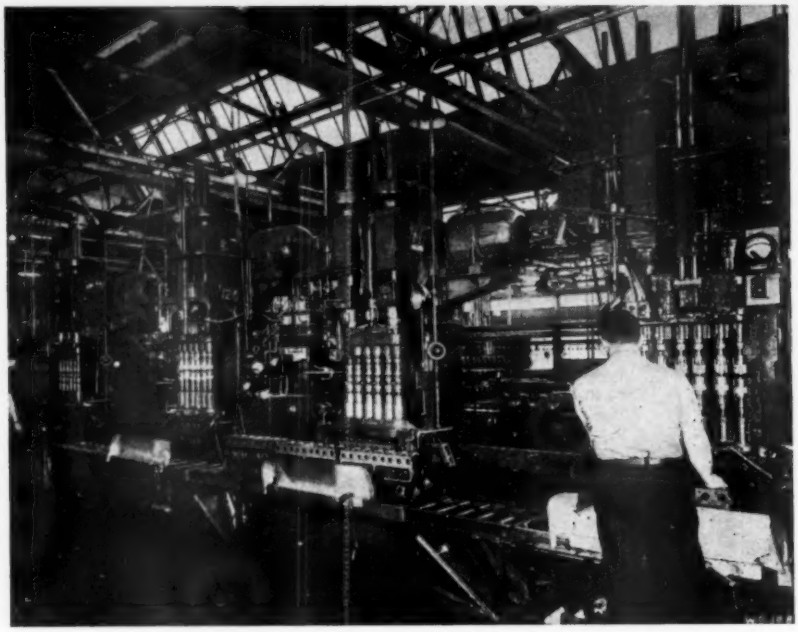


Fig. 12—A Typical Production Illustrating Installation of Hydraulic Honing Tools.

Fig. 13—Above, Close-up View of Multiple Spindle Honing Machine Equipped with Hydraulic Honing Tools.

ters, has demonstrated that the maximum production obtainable is approximately 20 to 25 blocks per hour. This operation comprises an approximate maximum operating speed of from 400 to 450 surface feet per minute at feeds of .004" to .008" per revolution. Under the most favorable conditions the finish produced requires from .0015" to .0025" to clean up in following operations.

Some production men, seeking better economic balance, are developing another trend of thought. This comprises the adaptation in semi-finish boring of stub bar spindles with two lip cutters, operating at approximately 280 surface feet per minute, and in the range of feeds from .016" to .040" per revolution, with calculated production of approximately 37 to 40 blocks per hour. This application would leave approximately .008" to .010" which would clean up economically in honing operations.

The present development and adaptation of induction hardening for cylinder bores will undoubtedly require improved mechanical and economic balance in processing. Whether this process may be used on cast-in-block bores or in wet sleeve liners, the processing of bores hardened to 35-40 Rockwell "C" scale, with distortion varying from .001" to .003" presents a definite economic problem. It is believed that with the increased stock removal and stone life now possible with hydraulic actuation, the honing process is indicated as the cheapest, most practical method of final processing consistent with the degree of accomplishment required.

The foregoing survey of current production processing methods and trends, and the new degree of stock removal accomplishment and controlled constant finish now possible and available with the newly developed honing equipment, suggests the importance of re-studying the entire subject of cylinder bore and block processing.

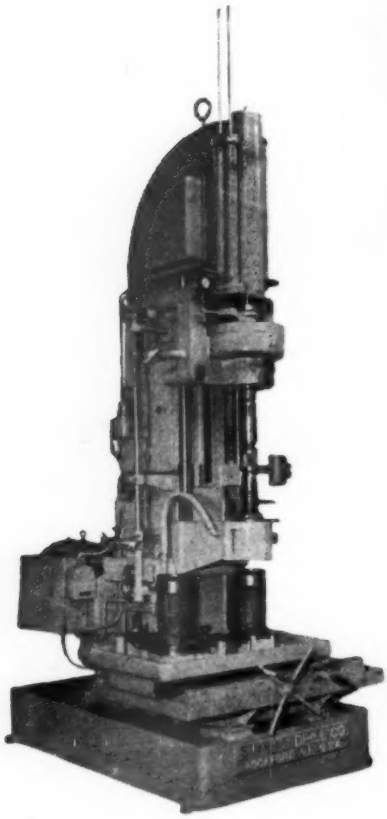
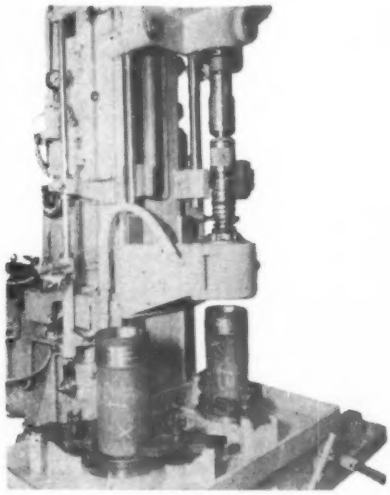


Fig. 14—Left, a Single Spindle, All-Hydraulic Honing Machine.

Fig. 15—Right, Hydraulic Honing Tool Installation.



Trim and Pierce Dies — *Their Construction and Design*

By JAY BOWEN
DIE EDITOR, A.S.T.E. EDITORIAL COMMITTEE

WHEN a stamping comes from the draw die it has yet to have draw flash and other surplus metal used in the drawing process, cut or trimmed from it; holes to be pierced in it and often many other forming and flanging operations applied to it. These succeeding operations can be classified as:—Trim, Trim and Pierce, Pierce, Trim and Flange, Flange, Form.

The designs of the operations range from very simple vertical action to very complex combined vertical, horizontal and angular motions. In planning or engineering these succeeding operations there are many angles to be considered by the Tool Engineer.

Primarily, the first thing to be taken into account is the production of a stamping as free from stretcher marks, recoils and guttering and other "die marks" as possible in keeping with economical production, eliminating all or as much hand finishing as possible. There are rare instances, of course, where the cost of hand finishing will not be as costly as die refinements to overcome it, this depending on the amount of production. Where production is high, elimination of hand finishing at any cost will pay large dividends.

We will first take up the design and construction of trim dies, as these are generally the succeeding operations to draw operations. The most important requirement in a trim die is that the panel be gripped between punch and pad in such a way as to avoid any distortion whatsoever caused by sag, springback, shear or cutting sections, etc.

Next a panel should be kept on carline or natural position as shown on part drawing if possible, so that in the manufacture of the die, templets and measurements and calculations can be made and obtained in the most simple manner without going through a great many complex projections and developments.

Special attention should be given to selection of press so that there is ample room with regard to stroke, loading and unloading, and to insure proper tonnage required to perform operation.

If the operation is a heavy one, cutting steels and flanging sections should be backed up in casting and castings suitably heavy to avoid springing. Simple and inexpensive trimming dies can be constructed with the aid of composite steel forgings for cutting edges, which should be used in their design wherever possible.

Piercing

Whenever piercing operations are incorporated in a trim die special attention should be given to disposal of the slugs produced when holes are pierced. They should be shed to one side or passed through the die and bolster to opening in press bed. If press is equipped with air cushions this cannot be done and in that event a slot is provided in bottom of die so that slugs can be pushed out with a stick, as they pile up or provide slot with a sheet metal tray to catch slugs.

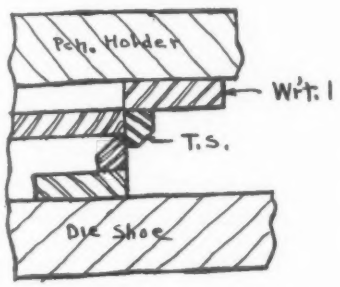


Figure 1. Showing application of composite cutting sections.

Cam Slides

When it becomes necessary to add cam slides in a die, many problems present themselves such as stripping, return of slide to its initial position and at times the interference of slugs from a horizontal punch with those of a vertical punch. Two piece gibs should be used wherever possible due to their simplicity and low cost.

Cam pierced holes should be stripped, if possible, by the vertical stripper with fingers or heels coming down on each side of punch. This will avoid use of a spring stripper or a more expensive cam actuated stripper on face of slide. In this case special note should be given to having proper travel on stripper so that it will remain firmly in place until cammed punches are completely withdrawn from holes. In most cases where cam slides are used in pierce dies, spring return is practical and economical but there are instances where travel is too great or it is impossible to gain enough pressure to strip punches with springs so that it becomes necessary to apply a positive method of return. This is generally accomplished by having back faces on driver.

The same principles of design as used in Trimming and Piercing can be followed in most cases in designing forming and flanging dies; the greatest difference being in rare cases of application of local blank holder or pressure pad.

In developing a die engineer or designer, some practical machine shop experience is a great asset. Also, pattern-shop, foundry and pressroom knowledge stands him well in hand. A designer should work at all times with these important functions in mind. A well designed die consists not only in the fact that it will produce a part but

(Continued on page 30)

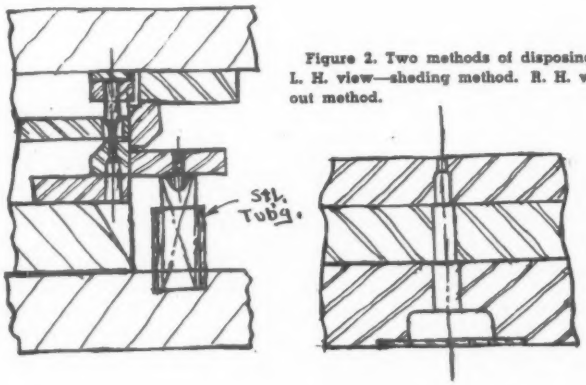


Figure 2. Two methods of disposing of slugs. L. H. view—sheding method. R. H. view—push out method.

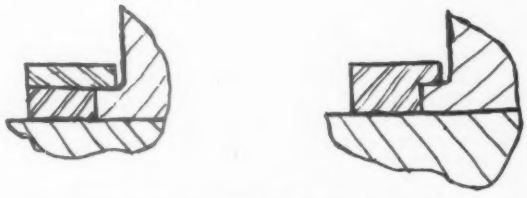


Figure 3. Gib construction. Left—two piece type preferable. Right—one piece type.

PRODUCTION PERSPECTIVES

NEWS OF MASS MANUFACTURING FROM EVERYWHERE

East

World industrial production declined slightly up till June, but "there is some evidence that the momentum of the decline is decreasing," a study by the statistical division of the National Industrial Conference Board revealed August 19. **In Great Britain and the United States indexes of production rose. Machine tool orders,** both domestic and foreign, appeared to **have achieved a considerable measure of improvement** last month according to reports now being circulated in business circles. **The July index, issued** by the **National Machine Tool Builders' Association, is expected to show a rather sharp rise, continuing the upward trend of June.** After tumbling quite precipitately earlier in the year, **the tool building business has encountered a marked improvement recently, reflecting in part the retooling and realigning of plants which has been going on in preparation for the expected upswing in domestic business, and in part the upsurge of pressure of war preparations abroad. In the opinion of Mr. W. E. Whipp,** President of the Monarch Machine Tool Company, **Sidney, Ohio, machine tool manufacturers will enjoy a sharp increase in volume of domestic business beginning this month and the fourth quarter should be very much better than earlier periods of the year.**

Several hundred men are being added to the payrolls as production gets under way at the Curtiss Aeroplane division plant of the Curtiss-Wright Corporation in Buffalo. Production plans at this plant call for an increase in output from twenty-two airplanes per month to fifty. It is expected that **this company will have on its payroll approximately 3,500 men by the first of the year** while the former payroll was about 2,800. The plant is said to have sufficient orders for planes from the United States and French governments on its books to maintain present operations for more than a year. **Tonawanda,** near Buffalo, **approved the application of the Wickwire-Spencer Steel Company for permission to construct a new factory building on River Road at** an estimated **cost of $300,000.**

From York, Pennsylvania, comes the **report that the number of wage earners employed in Pennsylvania factories declined two per cent** and the amount of wage payments decreased four per cent from the middle of May to the middle of June, according to indexes compiled by the Federal Reserve Bank of Philadelphia on the basis of reports received from 2,332 establishments employing about 424,000 wage earners with a weekly payroll of $9,184,000. In the industrial areas of York and Adams counties, it was stated, the index of employment in June was 62.3 percent of the 1923-1925 average and was but 21.4 percent below June, 1937.

For generations the disposal of the "pickle liquor" the liquid sludge which remains in pickling plants of steel companies after the acid bath has removed the scale from steel has presented a real problem. **The process of treating this old steel mill nuisance is in the hands of a new Cleveland Company, Allied Development, whose president is W. W. Vandeveer. Jacob Rentschler,** Willoughby, Ohio, chemist, **has been on this problem for several years and he and his associates have been running a pilot plant in Willoughby.**

The **Sharon Steel Hoop Company** at Sharon, Pennsylvania, has **started** to build a **$90,000 addition to make a new product from the spent pickle liquor—a building material of remarkable insulating properties.** This material will be pressed into sheets of the desired size and thickness and may be used for insulation board or pipe covering. The Sharon report is that an inch thickness of the new product will have the insulating value of fifteen inches of brick wall and that it may be laid up like brick.

New England

Industrial operations in New England are showing more than season gains and **reports from Massachusetts** especially, **shows considerable optimism.** In Worcester workers are being re-employed in a "back-to-work" movement, according to the Worcester office of the Massachusetts Unemployment Commission. **These men returned to jobs at Norton Co., American Steel & Wire Co.,** and **Heald Machine Co.**

In Springfield indications are that employment will show gains as soon as the vacation period is over. **Indian Motorcycle Co., U. S. Armory and Fiberloid Corp. are maintaining a good employment rate. Westinghouse and American Bosch are still operating with curtailed forces,** but both plants expect to recall workers in the latter part of September. The Boston and Maine shops, employing 400, closed down August 15 for four weeks.

The Rodney Hunt Machine Co. of Orange reports a slight upswing. Herbert M. Johnson, secretary, says the outlook is brighter.

With the volume of business on the company's books advancing, **the South Works of the American Steel & Wire Co. at Worcester, announced that another open hearth furnace has been opened.** About 25 employes were recalled. The length of time the furnace will be operated will depend on the continuation of orders, according to company officials. The furnace will replace depleted inventory of steel ingots.

To relieve crowded conditions in the large iron machine shop the **Chapman Valve Manufacturing Co.,** Springfield, is **to build a $50,000 addition** to the present structure. **Frederick C. Low,** treasurer of the company, said that machines will be rearranged in the iron machine shop. There will be provision for future expansion. The new addition will be a steel frame building of brick siding, similar to the present structure. **Reed-Prentice Corp.** in Worcester **is busy producing machine tools for foreign countries. General Electric Co. of Lynn,** is **building a manufacturing building on Western Avenue, that city.** It will be brick and tile, **to cost $90,000.**

Manager Robert MacFarlane of **the Torrington Co.** in Orange **announces that working hours have been increased due to extra orders.**

The establishment of a new celluloid plastic business in Leominster to be located in the unused Foster-Grant factory will be realized soon, **according to Robert S. Appleton,** secretary of the Chamber of Commerce. The **new concern,** expected to employ nearly 50 men when operations start, **is owned by I. J. Zellin of the Worcester Leather and Findings Co. of Worcester and F. A. Brodeur, formerly** an executive **of the New England Novelty Co.**

John F. Tinsley, for twenty years vice president and general manager of Crompton & Knowles Loom Works, Worcester, has been elevated to the presidency to fill the vacancy resulting from the death of Dr. Homer Gage.

Employment increases in a number of factories, establishment of many new manufacturing enterprises and some activity in the industrial construction field give promise of early improvement in Connecticut production schedules. In the small community of Wallingford, for example, **R. Wallace & Sons Mfg. Co.,** silverware, **has stepped up its working schedule. Wallingford Steel Co. has increased weekly hours in several departments on orders from automobile manufacturers,** and **H. L. Judd Co. has started a 40-hour week** in a number of rooms. **Whitney-Blake Co.,** Hamden, **reported a steady increase in new orders** during late July, **with a backlog as of August 1 amounting to $350,000.** A plant expansion program is being considered. On August 8 the **William L. Gilbert Clock Corp., Winsted, resumed a five-day week** of nine-hour days, as compared with four days and eight hours. **American Brass Co.,** Ansonia, is **building a sheet copper rolling mill** to cost $50,000. **Farrel-Birmingham, Inc., Ansonia,** is **building an extension to its foundry.** Hitchcock Gas Engine Co., Bridgeport, is erecting a $12,000 factory building. **Scovill Mfg. Co.,** Waterbury, has **elected John H. Goss as president** and general manager, succeeding Edward O. Goss, deceased. **J. H. Goss retired as general superintendent** and the vacancy was not filled. **E. J. Reardon, previously su-**

(Continued on page 30)

SEPTEMBER CHAPTER MEETINGS

Chapter Meeting Announcements must be received on or before the 20th of preceding month to appear on this page. Members and friends of The Society contact Chapter Secretaries for meeting details if your announcement does not appear below.

BALTIMORE

September 12, 1938—Longfellow Hotel, 2 West Madison St.
Dinner, 7:00 P. M.
Technical Session: 8:00 P. M.

Speaker: Mr. Charles L. Burns, Pratt & Whitney Aircraft Division, United Aircraft Corp.
Subject: "Precision Tools for Aircraft Motors."
(Illustrated with slides and movies.)
Please make reservations early by calling Vernon 5353.

BUFFALO

September 12, 1938—7:00 P.M. Buffalo Trap and Field Club.

Speaker: E. J. Bryant, Gauge Engineer.
Subject: "Gauges and Gauge Tolerances."
Reservation: Mr. William Weinreich, 649 Minnesota Ave., Buffalo, New York.

CHICAGO

September 12, 1938—6:30 P. M., Reception, buffet supper at 6:45 P.M. 65c per person—Harrison's Air-Cooled Restaurant Lobby, 80 E. Jackson Boulevard.
Technical Session at 8:00 P.M.

Speaker: Mr. Richard K'Burg, E. I. DuPont DeNemours Company.
Subject: "Hardening by the Use of Cyanide" with an entertaining motion picture film entitled "Wonder World of Chemistry."

CINCINNATI

September 15, 1938

Through the courtesy of the Cincinnati Milling Machine Company the membership of Cincinnati chapter is invited to partake of the hospitality of the Company, and to be its guests at a dinner. Contact local officers for further details.

CLEVELAND

September 13, 1938—Dinner, 6:00 P.M.
Technical Session: 8:00 P.M.
Germania Turnverein Vorwaerts (German Club), 1622 East 55th Street, Cleveland.

Speaker: Mr. L. A. Trofimov.
Subject: "Inventiveness."
Reservations: Dinner a la Carte—Those desiring full course dinner ($1.00) make reservations with Mr. H. P. Boggis—Endicott 3611.

DETROIT

September 8, 1938—Dinner, 6:30 P.M., $1.50 per person. Hotel Fort Shelby.
Technical Session: 8:00 P. M.

Speaker: L. C. Gorham, Gorham Tool Company.
Subject: "Classification and Application of High Speed Steels."
Illustrated with slides. General discussion to follow.

MILWAUKEE

September 15, 1938—Members of Milwaukee chapter are requested to watch local newspapers for future announcements.

NEW YORK-NEW JERSEY

September 13, 1938—Dinner at 6:30 P.M., Robert Treat Hotel, Newark, N. J. 8:00 P.M.

Speaker: John H. Van Deventer, Editor "The Iron Age."
Subject: "Social Aspects of Tool Engineering."
Reservation: Ben Brosheer (Medallion 3-0700).

NEW YORK-NEW JERSEY CHAPTER NO. 14 GOLF TOURNAMENT AND STAG OUTING

September 24 at the Pennbrook Golf Club, Basking Ridge, N. J., just south of Morristown

Morning golf, lunch, afternoon golf, and evening banquet If you arrive after lunch the price is but $3.00. Guest tickets are 50c additional. Other things besides golf and tournament. Soft ball game, horse shoe pitching, shot-putting, tug of war, all for trophies and prizes.

There will be entertainment at the evening dinner and there will be indoor sports on the clubhouse veranda—jack straws, tiddely winks, etc. Sheriff and chief of police will be present, so no cheating.

Tom Orchard, chairman of Entertainment Committee, 185 East 33rd St., Madison, N. J. Get tickets from him or register with him.

CENTRAL PENNSYLVANIA

September 13, 1938—Dinner, 6:30 P.M., at York Y.M.C.A., York, Penn., Pennsylvania and Newberry Streets.
Technical Session: 7:45 P.M.

Speaker: Mr. W. J. Diederichs, Metallurgist, The Auto Car Company.
Subject: "Heat Treatment."
Reservations: Must be received by the chapter secretary, W. Spangler Graby, 708 A. W. Market Street, York, Pa., not later than September 10th.

PHILADELPHIA

September 8, 1938—Dinner, 6:30 P.M., at the Adelphia Hotel.
Technical Session at 8:00 P.M.

Call chapter secretary for further details.

PITTSBURGH

September 9, 1938—Dinner, 6:30 P.M., McCann's Dining Room. $1.25 per plate.

8:00 P. M.—Business Meeting to discuss final arrangements for Semi-Annual Directors' Meeting and Convention to be held in Pittsburgh, Pa., October 14 and 15.
Important: All members are urgently requested to be present.

ROCKFORD

September 29, 1938—Dinner, 6:30 P.M., Faust Hotel. Celebrating Rockford Chapter's First Anniversary. Meeting Celebration: 8:00 P. M.

Speakers: Mr. Ralph E. Flanders, President Jones & Lamson Machine Company. Past President National Machine Tool Builders' Association.
Mr. Ford R. Lamb, Executive Secretary, A.S.T.E.
Educational exhibits, entertainment, splendid dinner, lectures, etc.

ROCHESTER, N. Y.

September 13, 1938—Time and location announcement by card.

Speaker: Prof J. J. Caton of Chrysler Institute of Engineering.
Subject: "Is a College Education Necessary?"

SCHENECTADY

September 15, 1938—Dinner, 6:00 P. M. Turkey Dinner, $1.25 per plate at "The Farm," 104 State Street.
Technical Session: 8:00 P. M. Rice Hall.

Speaker: Prof. John J. Caton, Chrysler Institute of Engineering.
Reservations: Reservations for dinner must be made not later than September 13th. Bring a guest. For further details phone General Electric Extension 4388.

SYRACUSE

Saturday, September 10, 1938, at Hiner Wadel's Grove, Fay Road and North Syracuse Road, Route 11 at Stop 6.

Lunch served from noon until 3 P.M.

Dinner served at 4 P. M. Clams in both cases.

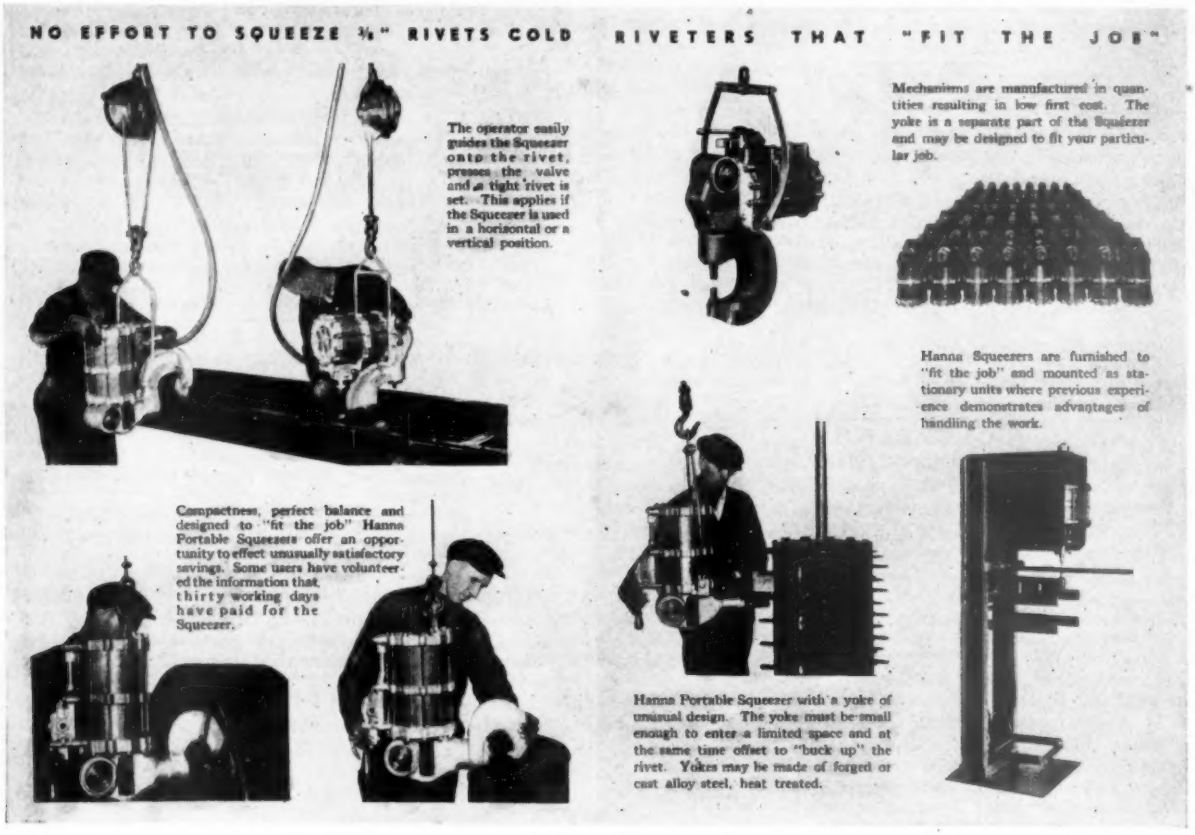
Lunch: Clam chowder, salt potatoes, raw clams, clam broth, crackers, suds on tap, wheel of fortune.

Dinner served at 4 P.M. Steamed clams, half broiler (fried in butter), sweet and white potatoes, corn on cob, bread and butter, coffee, kuchen

Sports 1 to 4 P.M. Time race, nail drive, egg tossing, ball game—Auburn and Syracuse members—horseshoe pitching contest, tug of war, bean guessing, rope link guessing. Join the fun. Prizes for all winners, door prize.

Reservations should be in by September 6 so that plans can be made. All tickets not disposed of by that time return to M. R. Ness who is in charge of tickets, Syracuse Supply Company.

Catalogue 227 Illustrates Just About Every Type of Squeeze Riveting


NO EFFORT TO SQUEEZE ⅞" RIVETS COLD
The operator easily guides the Squeezer onto the rivet, presses the valve and a tight rivet is set. This applies if the Squeezer is used in a horizontal or a vertical position.
Compactness, perfect balance and designed to "fit the job" Hanna Portable Squeezers offer an opportunity to effect unusually satisfactory savings. Some users have volunteered the information that thirty working days have paid for the Squeezer.
RIVETERS THAT "FIT THE JOB"
Mechanisms are manufactured in quantities resulting in low first cost. The yoke is a separate part of the Squeezer and may be designed to fit your particular job.
Hanna Squeezers are furnished to "fit the job" and mounted as stationary units where previous experience demonstrates advantages of handling the work.
Hanna Portable Squeezer with a yoke of unusual design. The yoke must be small enough to enter a limited space and at the same time offset to "buck up" the rivet. Yokes may be made of forged or cast alloy steel, heat treated.

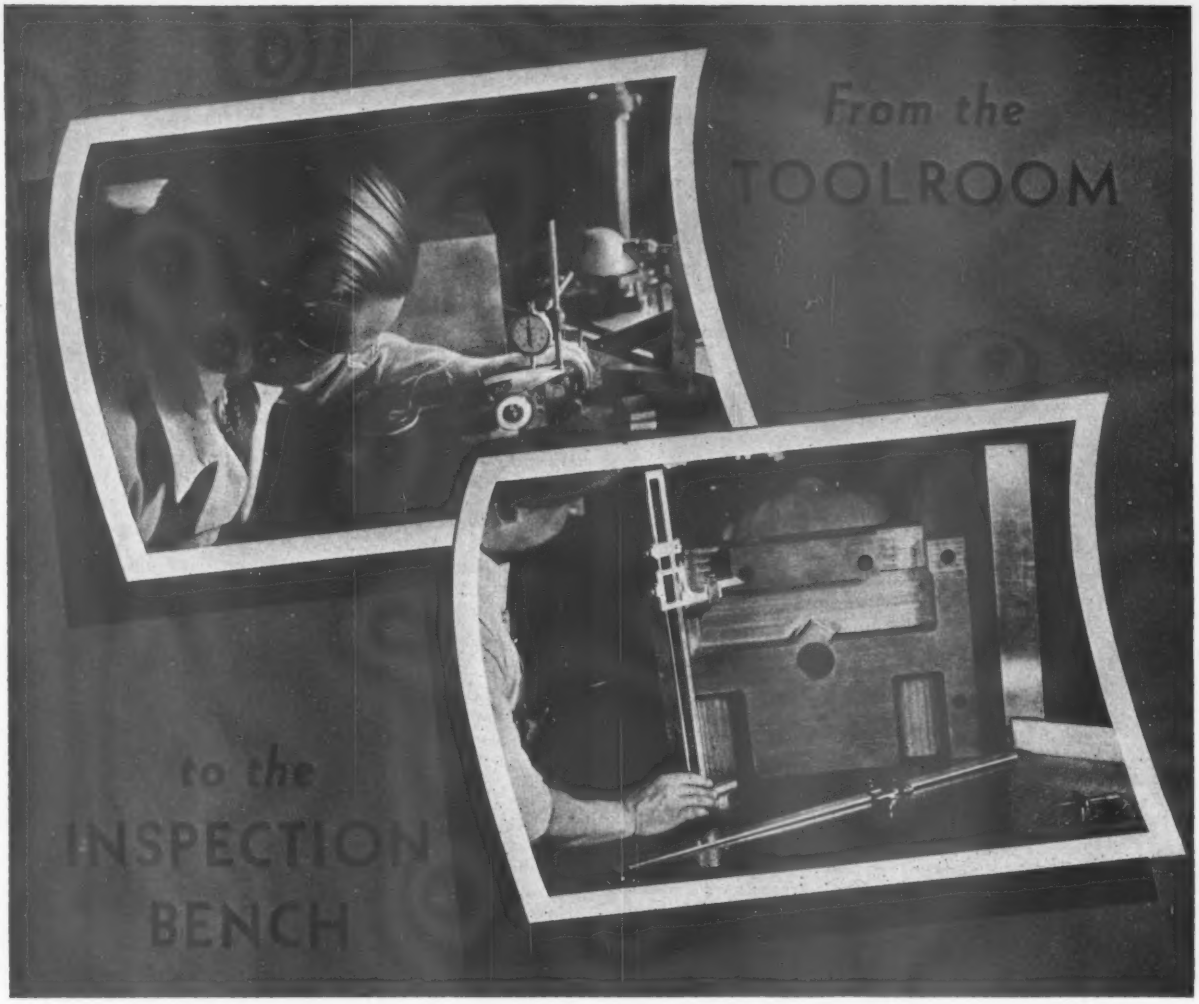
AN OPERATING speed of 40 to 50 strokes per minute assures "most rivets per day per man." Where riveted assemblies are of such a nature that a portable squeezer can be used, a small, compact, light-weight squeezer fed by a single flexible air hose is offered in several styles. Here again exceptionally attractive prices, made possible by manufacturing economies and elimination of maintenance expenses results in maximum savings.

The Hanna Line of Squeeze Riveters includes more than one thousand portable and stationary machines of different size, style, and capacity. This permits selection of a standard Squeezer to "fit the job" and assures lowest first cost.

The simple mechanism of the Hanna Squeezer needs no attention or adjustments, insuring uninterrupted production and minimum operating cost. Replacement of any parts if necessary can readily be made by any shop mechanic.

A copy of this catalogue will be furnished upon receipt of your request. Any one of the several illustrations may suggest where a decided improvement can be made over your present method of fabrication. Have catalogue 227 available to look through at some time.

Hanna Engineering Works, 1768 Elston Ave., Chicago, Ill. Detroit Representative: E. J. Charron, 2842 W. Grand Blvd. Telephone, Madison 2357.



STARRETTS *set the standard*

There's one simple way to raise the standard of accuracy in your shop — that's to see that every job is laid out, produced and inspected with Starrett Tools and Dial Indicators. With safe, dependable Starrett precision guarding the accuracy of every operation, there's no need for doubt or uncertainty. Even the closest tolerances leave plenty of room for speed and confidence. Have you the new Starrett Catalog No. 26T? It describes and illustrates many new additions to the complete Starrett line. Write for a copy.

Top Photo: Checking an angle parallel with a Starrett Dial Test Indicator, Universal Protractor, Toolmaker's Clamp, Steel Square and Micrometer.

Bottom Photo: Inspecting a die with Starrett Vernier Height Gage, Vernier Caliper, Micrometer Depth Gage and Steel Square.

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

World's Greatest Toolmakers — Manufacturers of Hacksaws Unexcelled — Steel Tapes, Standard for Accuracy — Dial Indicators for Every Requirement

Standardize on

STARRETT TOOLS

BUY THROUGH YOUR DISTRIBUTOR

Chapter Doings

Baltimore chapter 13 stands ready to disprove the age old idea that they have been assigned an unlucky number. This chapter **had its inception on October 13,** 1937, and the **first annual outing** was held on **August 13, 1938.** Despite this repetition of the Baker's Dozen, Dame Fortune has smiled upon them. When they closed their first technical season their **assets** were very **favorable.** Not just in dollars and cents but in a satisfied and enthusiastic membership which is unanimous in the opinion that the American Society of Tool Engineers is a worthwhile organization. Their **first outing** was **a success** and was **held at Bay Front Beach.** Members and their families had an enjoyable time at various games after which they cooled off in the waters of the Chesapeake. **Mrs. Low,** wife of Chairman Low, is the **champion kicker,** having won the shoe kicking contest. The **sack race** was **won** by **Karl Kalber** but my spies inform me that this race was not on the up and up because one of his seconds was at the finish line with a bottle of cool amber fluid as an extra incentive.

Dayton suspended technical meetings during July and August and are having two general get-togethers at which they hope to get better acquainted. This was decided at their June meeting. On **July 18th,** they **had the first meeting** of this kind **at the country cabin of Walter Olt,** secretary. That was swell of you, Walt, and we are sure the boys had a good time because we have been informed that the **meal was excellent** and the **spirit of good fellowship that prevailed during the games leads us to believe that great things may be expected from chapter 18.**

Milwaukee chapter will hold its first meeting of the coming season on September 15th. **Members** are requested to **watch their local newspapers for further announcements. George Smart,** their organizer and first chairman, has resigned his position as Chief Tool Engineer, General Machinery Division, Allis Chalmers Mfg. Company, to **accept a position as Sales Engineer with the Acme Machinery Company of Cleveland, Ohio. Here's wishing you success, George,** in your new venture and we'll be looking for you to call on the rest of us A.S.T.Eers in an effort to dispose of your wares.

For the first time the **Rochester chapter members put on their play clothes and gathered on the shores of Irondequoit Bay** and forgot about the serious business of Tool Engineering. The **first picnic was held on July 23rd** at the Newport House with **134 members and friends** who indulged in the steak dinner and other activities which featured the afternoon.

Chairman **C. E. Lucas** is to be complimented upon the success of the affair, as all reports indicate those present had a swell time. (Incidentally the chapter did not lose any money on the affair.)

Many of the members through their own and also company connections made generous contributions in the form of prizes.

The **chapter** is **looking forward to the results of the photographic efforts of member Engineer Frank O'Brien,** who **took colored moving pictures.** We understand **Mr. O'Brien will show these pictures at a later date** and undoubtedly will deliver an appropriate talk along with them.

The membership is now looking forward to the first Fall meeting, according to **C. G. Newton,** Publicity Chairman, Rochester chapter.

R. E. Laffler, publicity chairman, reports that the **St. Louis chapter** held its **first annual picnic at Laffler's Farm in the Ozarks on July 23.** A large crowd attended, the festivities starting before noon and lasting late into the evening. **Credit** is **due Mr. Doogan** and **Mr. Steinman** for their untiring efforts in getting everything planned.

As predicted, the fun was continuous. We were certainly glad that **Harry Linders** was **one of the early birds** in view of the fact that we had trouble with the cooling system on the beverage container. After the use of many tools, Mr. Linders finally was able to satisfy our thirst.

Mr. Neimann, as usual, **was the soda peddler.** Enough said!

Mr. Walter Linders, our **photographer,** was on hand **to catch the members** and guests as they arrived. One of our new members, **Mr. Joe Sunnen, also** proved to be **a** very **good cameraman.** We are glad to have Mr. Sunnen as a new member even though it did take a picnic to secure his membership.

The **games went off in grand style,** cork ball seeming to be the most popular. The same was true of the horse shoe game. The players seemed to see the pegs pretty well early in the day, but around five o'clock they began to complain that the pegs were moving. Our good friend, **Mr. Andrews,** was thoughtful enough to bring along a slide rule which helped to straighten out a number of difficulties. We also had quite a lot of trouble on the driving tee. The boys could not keep the balls in Laffler's pasture.

In **the pinocle game** under the stars **between four well known A.S.T.Eers** each player had a kibitzer. The stakes were moderate, the bidding high, the sets often, and the kibitzers well satisfied.

We are **now waiting with interest the showing of the pictures, as** we know **a good many of the members were snapped off guard.** Announcement will be made later as to the meeting at which these will be shown.

The 1938-39 **Hartford chapter season,** says F. L. Woodcock, Secretary, **will open October 3rd with a dinner meeting at the City Club,** Allyn and Trumbull Streets, which **will feature the return of Dr. John J. Caton, head of the Chrysler Engineering Corporation,** who spoke so interestingly last season **on the subject** of **"Behind the Scenes in Engineering."**

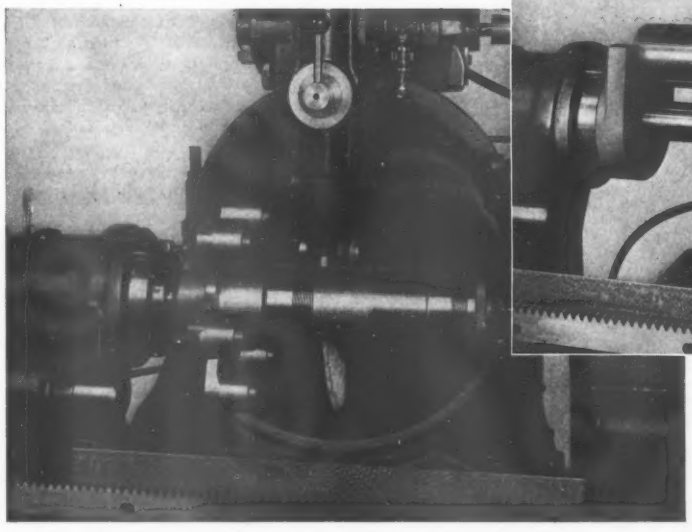
It is expected that this will launch the year with a flying start and it is **requested that members file reservations early with the officers in order to aid the program committee in making adequate preparations.** A record breaking gathering is expected due to Dr. Caton's popularity, and other features which are promised.

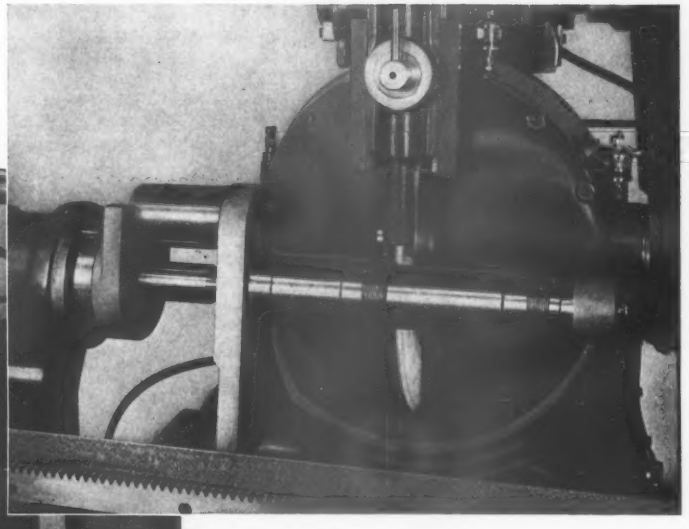
(Continued on page 47)

Officers of recently chartered Schenectady Chapter, A.S.T.E. Top row, left to right: G. F. Murphy, Secretary, C. H. Borneman, Meetings Chairman, R. E. Ellis, Treasurer. Lower row, left to right: F. Diehl, Vice Chairman, E. W. Ernst, Chapter Chairman. All of these men are connected with General Electric Company in Schenectady.

THREADS

Ground from the solid





•QUICKLY
•ECONOMICALLY
•ACCURATELY
•AUTOMATICALLY

The crankshaft and propeller shaft are vital parts of an airplane engine. A prominent manufacturer recently chose the J&L 8 x 48″ Automatic Thread Grinder (with special 19″ swing capacity) for grinding the threads on these parts. They are ground from the solid with the following high rates of production—

The Crankshaft **has a 2¾″ diameter 2 m/m thread ¾″ long, ground in eleven minutes, and a 3 9/16″ diameter 2 m/m thread 15/16″ long, ground in eighteen minutes.**

The Propeller Shaft **has a 3 7/16″ diameter 12 thread ⅝″ long, ground in eight and one-half minutes, and a 3 15/16″ diameter 2 m/m thread ⅞″ long, ground in eleven and one-half minutes.**

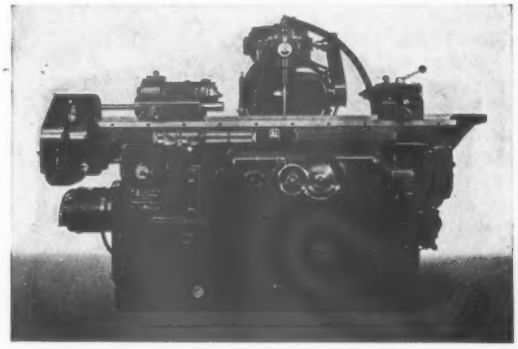
ALL FOUR THREADS ARE GROUND FROM THE SOLID

EACH THREAD IS ROUGH AND FINISH GROUND AT ONE SETTING

ALL THE TIMES GIVEN ARE AVERAGE FOR A DAY'S RUN, AND INCLUDE A 10% ALLOWANCE FOR EXTRAS

The J&L Automatic Thread Grinder produces these threads with correct lead, form and pitch diameter, and with the high quality of finish required in airplane engine work.

For further information, send samples or blueprints of your threaded parts.



JONES & LAMSON MACHINE CO.
SPRINGFIELD, VT., U. S. A.

Handy Andy's . . WORKSHOP . .

An acquaintance dropped off recently, just as he had begun to build up a nice little jobbing business. Special equipment and so on. And the other day his widow dropped in, a little woman with silvering hair, but alert, capable, inspiring confidence. She discussed drawings intelligently, proposed to complete orders in process, would carry on. I wonder if the average man considers the potential competence of women in industry, or gives thought that in innumerable cases the woman is the mainspring driving the works. Personally, I have a very high regard for women, their unswerving loyalty, their courage in the face of adversity, their innate intellectual qualities, all entirely aside from individual appeal. And frankly, I never want to see the day when a charming woman doesn't quicken my pulses. May the hill remain below the horizon.

▼ ▼ ▼

Confession, 'tis said, is good for the soul. Now, I'm not much for procrastination, rather, have something of a rep for getting things done. The necessary things; being busy, and time flying fast, non-essentials (?) sometimes lie abiding. Like personal correspondence. You know, I'm just beginning to answer personal mail that's been accumulating since Christmas—and wow, is it a stack! At that, my system has its advantages; after a few months, there's no need to answer, my correspondents having forgotten what it's all about. But not me; I answer—eventually.

▼ ▼ ▼

Bob Street sends me an annual card, and next year — no, this year! — I'm going to get the jump on him. Other cards (I've had a swell evening going over the collection) are from Tool Engineer advertisers, and I like those because it's like getting mail from the family. Others again are from equipment makers and venders, many of whom are A.S.T.E. members. And while some may regard Christmas cards as a matter of seasonal form, they invariably give me a thrill of pleasure. At that season, every card is personal, somebody thought of me. One card I acknowledge it now) is from Emory Kuisel, who may or may not be an A.S.T.E.er. Anyway, he comes to our parties and taught me how to shoot craps; that is, he told me when I won (and I did) and that is the really important part about the game. By the way, I got my money from the Sweepstakes. I know you were all worrying about that, so now you can sit back and relax. Me too.

▼ ▼ ▼

Speaking about Xmas cards reminds me that I'm supposed to be planning a new home on spare time (spare time!) and that it must include a rumpus room—as Charley Kline calls it—and a padded cell where I can do my writing without having the cat stomping around me. I need some good posters, preferably the kind that Al Sargent has scattered around his walls. Gals and such (streamlined preferred but run-of-the-mine accepted) and some nice landscapes—and seascapes. And some ashtrays, like the ones they gave away at the last Tool Show—gosh! I played the piccolo that time but will carry a tuba next year. Anyway, remember me pleasantly when calendar time rolls around, will you? (Adv.)

▼ ▼ ▼

I started this before the August "Tool Engineer" came around, but it's here now, and I notice that Roy published that letter of Jean Bouton's that he was telling me about. Thanks, Jean! But you know, I didn't think of that one ("Nut crackers, etc."). That was George Keller's story, and I heard of it in a round about way, thought it was good and rounded it out. Not knowing George at the time (I do now, and he's a regular guy) I didn't know but what I might get him in Dutch by giving direct credit (not the Lawson kind) so I just inferred that it was borrowed thunder. I never steal my stuff outright. Anyway, it's all straightened out now and everybody happy.

▼ ▼ ▼

You noticed a little change, last issue, in the matter of Chapter News. We've done a bit of streamlining, long over-

(Continued on page 28)

YOU CAN DEPEND ON THE EFFICIENCY WITH WHICH THEY DO THEIR WORK

TOMKINS-JOHNSON CO.

The **RIVITOR** Automatically feeds and sets solid rivets up to and including 1/4" in diameter and 7/8" long.

The **CLINCHOR** Automatically feeds and sets all types of clinch nuts.

T-J AIR CYLINDERS To exert power movement from 100 lbs. to 12,000 lbs. (direct). Made in all the right styles and sizes with strokes to suit your requirements.

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GRAND RAPIDS—Joseph Monahan
HARTFORD—George M. Pearse, Jr.
MILWAUKEE—J. M. Grimstad
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PHILADELPHIA—W. A. Rankin (Drexel Hill)
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TOLEDO—Kirkby Machinery & Supply Co.
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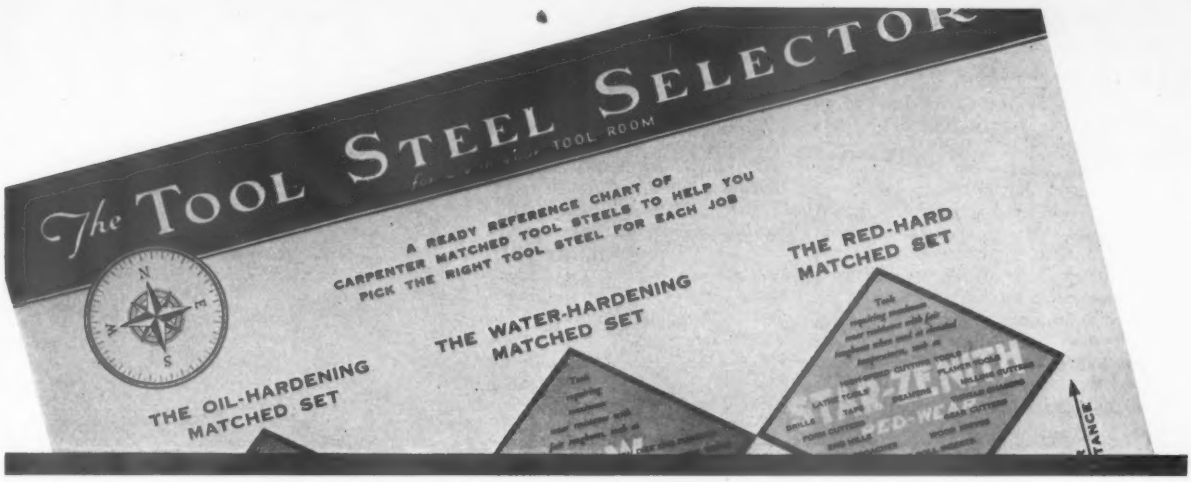
EUROPE—Gaston E. Marbaix, Ltd., London

Get in touch with them or write to us at 624 N. Mechanic St., Jackson, Mich.


The TOOL STEEL SELECTOR
A READY REFERENCE CHART OF CARPENTER MATCHED TOOL STEELS TO HELP YOU PICK THE RIGHT TOOL STEEL FOR EACH JOB
THE OIL-HARDENING MATCHED SET
THE WATER-HARDENING MATCHED SET
THE RED-HARD MATCHED SET

Follow this **QUICKER, SAFER** *Method to get what you want in your Dies and Tools*

When figuring the tooling of a new model, you know better than anyone the requirements which those tools must meet.

You know where extra wear resistance is needed—where maximum toughness is called for—where freedom from hardening distortion is demanded. In short, you know what you want.

To help you get what you want, and save you time and trouble, the Carpenter Steel Company has worked out a systematic method for selecting the right kind of tool steel for each and every job. It places at your finger tips the type of knowledge formerly possessed only by the steel mill "expert".

Send for the convenient Wall Chart that helps you apply this simplified method to your tooling problems. With it you can combine your knowledge of tooling with "mill knowledge" of tool steel.

Tool Engineers who have already discovered the advantages of this new method, report lower tooling costs—increased production per tool—and greater freedom from tool troubles. Write today for your free copy of the Tool Steel Selector—a large, easy-to-follow Wall Chart that shows how to get what you want. It will help you with your tooling-up recommendations.

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Please send me free, and without obligation, a copy of your large Wall Chart Tool Steel Selector.

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ADDRESS _____

HANDY ANDY'S WORKSHOP

(Continued from page 26)

due but inevitable, started at last. And we'll improve as we go along, just as we have been improving the "Tool Engineer" little by little. Rome, you know, wasn't built in a day, although the job might have been expedited some if the A.S.T.E. had been launched some twenty-five centuries earlier. Well, better late than never. Anyway, we're giving Geo. Keller of Buffalo a pat on the back for his maiden (?) effort as Chapter Editor. Work with him, you Pub. men North, East, West, South, and get your stuff in to him in time so that he can do a bang-up job. You'll like his line once he gets to feeling his oats.

Jay Bowen (he's handling dies, you know) is a bit pressed for time right now, what with his boss crowding him—and maybe you think mine isn't riding my tail!—but we're going to have some mighty fine papers on dies during his tenure. I know Jay, an old-timer who knows his stuff, rock solid and a fine gentleman. And Dave Forsman is doing a yeoman's duty gathering in technical articles, and they're coming better and better, if that is possible. An enthusiast, Dave, well liked by everybody. Well, them's the three musketeers behind the editorial chairman, and if we don't go to town now it'll be a wonder.

▼ ▼ ▼

I'd like to ask a little favor from you boys around the country. Partly (mostly, I guess) for the pleasure of getting acquainted with you, and partly because I promised to help a friend out who wants information on shops and trade schools that have apprentice courses in tool and die making. He has published an exceptionally interesting book on vocational guidance—"Your Place in Life" *—and he wants more information. Will you help me out? Honest, now, because this is really a test case to find out if I have any friends, also, to ascertain if anyone reads this column. Write me c/o "The Tool Engineer"—please! Lafayette, here we come!

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* Handy Andy omitted to mention that he contributed a chapter, declared to be a masterly example of expository writing, to "Your Place in Life." The book should have a place in every vocational school in the country.

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STANDARDS OF EFFICIENCY
Improved Tool Life!
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TRADE MARK REGISTERED
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Please address request for free sample and booklet to our general offices at 2727 SOUTH TROY STREET, CHICAGO

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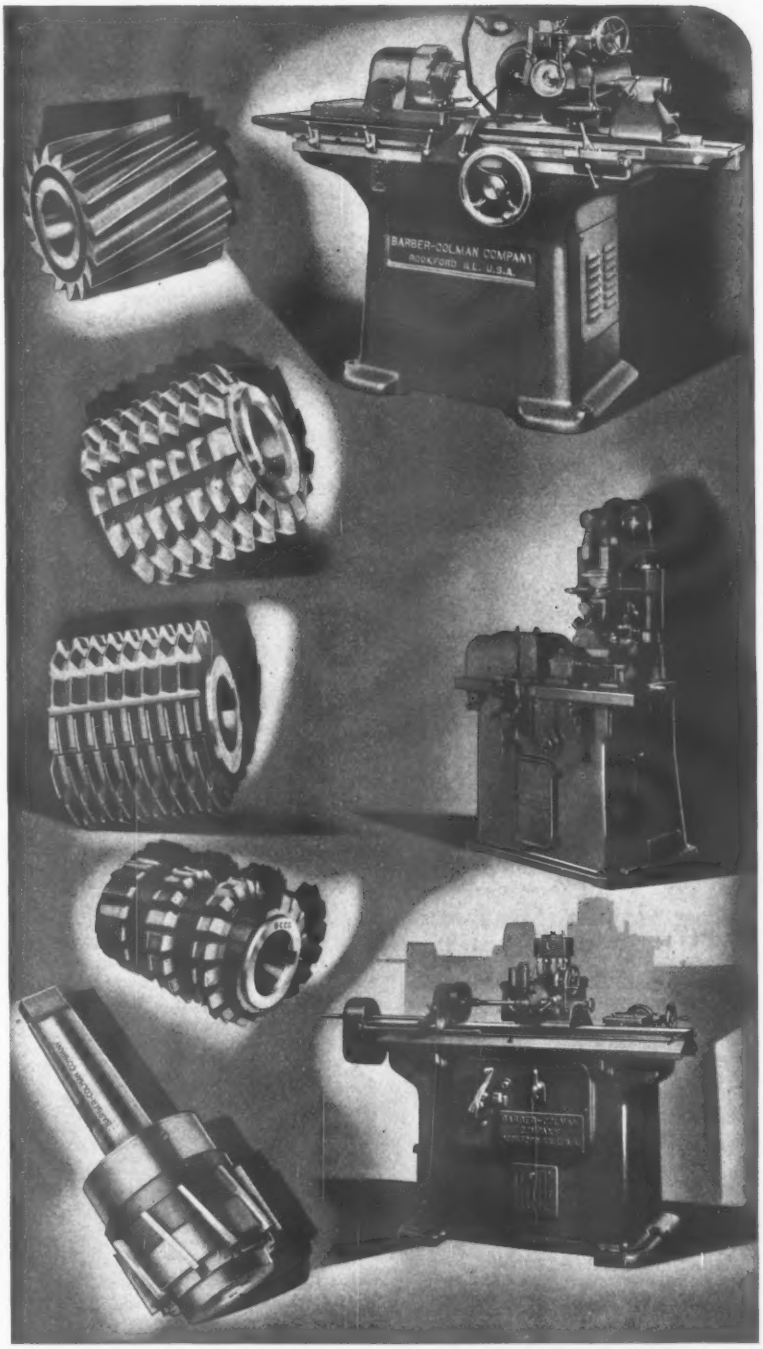
SAVE TIME AND MONEY!

Use Barber-Colman Cutting Tools and Sharpening Machines



When you get right down to it the production, and the return on your investment, obtained from a machine tool depends largely on the cutters used, their quality and condition.

The new Barber-Colman Combination Sharpening Machine gives *positive mechanical control* of all its sharpening operations; provides new precision, convenience and economy in sharpening *any* make of Reamer, Hob, or Milling Cutter.

Use Barber-Colman Reamers . . . save time and money in producing extremely accurate, straight, truly round holes. When a fairly large number of Barber-Colman Reamers are used daily, our Reamer Sharpening Machine restores original cutting edges most economically.

Use Barber-Colman Hobs . . . with form-relieved teeth for ordinary commercial limits, with ground tooth-forms for highest precision and finish. Secure maximum production at minimum cost by keeping hobs in prime condition always. Large plants save time and money by doing this on Barber-Colman Automatic Hob Sharpening Machines. Smaller shops use the Combination Sharpening Machine.

Use Barber-Colman Milling Cutters, standard or special. Their design, materials, manufacture, heat treatment and finish are held to highest standards. Their use saves time and money.

Consult Barber-Colman engineers freely for ways to save time and money in connection with Reamers, Hobs, Milling Cutters and their sharpening.

BARBER B-C COLMAN

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MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

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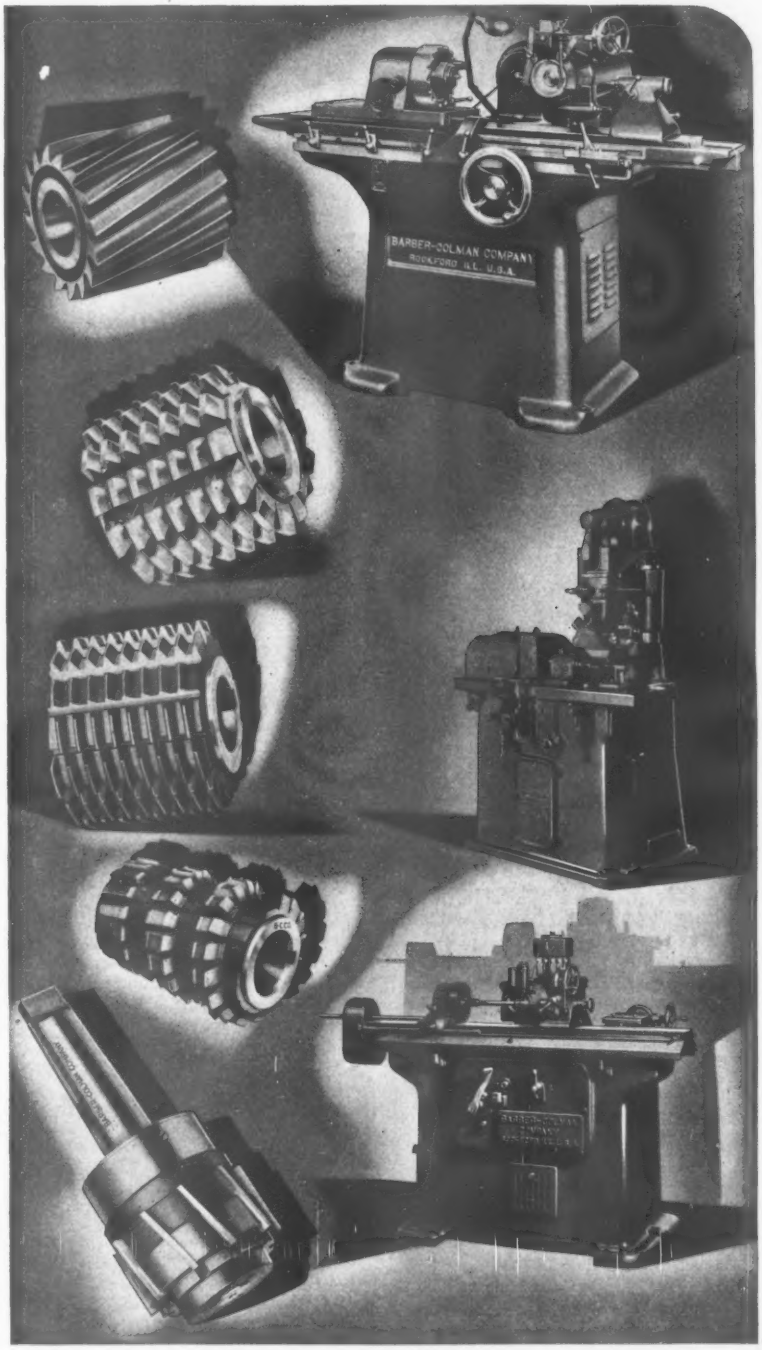

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TRIM AND PIERCE DIES

(Continued from page 19)

that the die itself can be produced with the least effort from pattern shop through try-out and after that to have the sturdiness and wearability to stay in press and run production without beating a path back and forth to the repair department.

In the past fifteen years many fine die accessories have been developed and are a real boon to the stamping and die business; to mention a few: quick change punches; hardened and ground dowel pins; hollow head cap screws; standard die sets; standard guide pins and bushings; standard hollow head shoulder screws and last but not least oval wire springs of a uniformity of temper that can only be appreciated by those who have had experience with the old square wire variety.

Blanking Dies

Blanking dies, while preceding other dies in operation line-up are, with rare exceptions, built last, so I am touching on them last. Blank dies in body stamping work are of the simplest construction. They are in most cases of the compound type due to the impracticability of passing a large blank through the press bed even if the press had the required opening. The gauging in most instances is the simplest due to the fact that in many cases only one blank is obtained from a sheet and at the most two. Sometimes gauging holes are pierced in the blank and now and then an odd shaped relief hole is pierced to facilitate drawing. In the construction, a standard die set and composite steel cutting sections are the rule. The die is provided with knockout only and no outside stripper. The scrap is cut away by scrap cutting sections, into pieces suitable for stacking and running through blanking dies for smaller parts where the gauge of metal is the same.

In the tooling up of a new model the auxiliary operations to a draw die are invariably neglected with the thought that when panels are produced from the draw they can be used for templets and developments to make these dies. This rule used to hold good, but in recent years delivery dates are stepped up from time to time and more and more heat is "put on" and about the time the draw die is 80% complete somebody decides that trim bucks or models had better be started and we go through a nice mess of theoretical development of trim lines and pierced holes and we whoop it up and the dies are "pushed" out. After dealers are supplied and first orders from the public are filled we go through a campaign of hole relocating and trim line changes, all of which causes hair to gray and fall out, brows to wrinkle and general debility. About that time it is almost Christmas and the extra charges are paid or "not paid" and the old man calls you in the office and says: "Now that things have simmered down you better take your vacation as next year is liable to be a 'big' year," (how we look for the "big" year), and we hike for Miami or some other place where we think the sun is shining and is "just like summer," and get it off our minds somewhat and then come back and champ at the bit till the next program starts, which is always sixty to ninety days later than all the boys "in the know" say it will be. Then its the same old round over and over again.

This article reminds me of several tunes that I have in my repertoire that I never did learn the finale and I get to going and cannot end, so this is it.

Gairing Standard Counterbores, Countersinks and Spotfacers will enable you to produce high quality work at low cost per piece--and that's the kind of work you have to turn out as Industry speeds up.

On operations which -- due to character of material, fixture design, or necessary chip clearance -- require specially designed tools, let Gairing Engineers consult with your designers. We've been doing these things well **for 21 years** -- maybe we can help you.

Ask for Bulletin 904 on Standard and Special Cutting Tools and Tool Holders.

COUNTERBORES AND COUNTERSINKS – SPOTFACERS – CORE DRILLS. HOLLOW MILLS – FULL FLOATING HOLDERS – MULTI-DIAMETER CUTTERS – TUNGSTEN CARBIDE TIPPED TOOLS – GAIR-LOCK BORING BARS AND MILLING CUTTERS

THE GAIRING TOOL CO.

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IN CANADA: GALT, ONTARIO

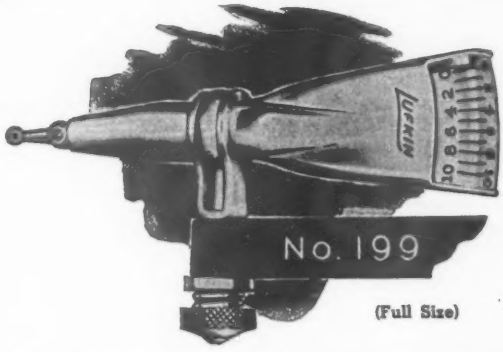
PRODUCTION PERSPECTIVES

(Continued from page 20)

perintendent of the American Steel & Wire Co. plant in New Haven, has been made general superintendent of both the New Haven plant and the Trenton, N. J. works. S. B. Metcalf, who has been general foreman of the rope department in New Haven, **becomes superintendent of the Trenton works** and **R. Murray,** previously general foreman of the New Haven wire department, **has been named assistant superintendent at New Haven. E. E. Caspell succeeds Metcalf as general foreman** of the rope department **at New Haven. Cloyd E. Burns** has resigned as vice-president and director of the Schick Dry Shaver Co., Stamford, and **has organized the Burns Specialty Co.,** Stamford, **to manufacture accessories for the Schick product.** He holds patents on a number of devices of his own design. **Modern Machine Tool & Die Co. has been formed** in Bridgeport **by W. G. Wessman.** Hartford Drop Forge Corp. has been organized at 846 Windsor avenue, Hartford. **Hartford Special Machinery**

(Continued on page 34)

NEW LUFKIN UNIVERSAL INDICATOR MAKES NEWS



(Full Size)

Indicating hole in Jig Boring, Milling Machine or Drill Press. Skeleton lines show how readings are easily taken while tool is in various positions in circle.

To be New is something, but to be new and make NEWS at the same time requires a lot more than the ordinary. And that's exactly why the new Lufkin Universal Indicator makes news today. Barely a month has passed since this extraordinary tool first appeared on the market, but today tool makers, die makers, machinists everywhere are talking about its many exclusive, highly practical features.

TWO READING FACES With a reading face on the end as well as the side, readings can be easily taken no matter in what position the tool is set. It is not necessary to use a mirror or resort to awkward positions to take readings with the new Lufkin Indicator.

ROTATING HEAD The Indicator Head rotates both horizontally and vertically, and because of the double reading face is made in one piece. This construction reduces wear and prolongs the life of the tool.

POSITIVE LOCK The clamping device is a nut, spring and washer, held together as one unit. During set-up and previous to tightening, it frictionally holds the Indicator in position.

Write for Catalog No. 7 describing the complete line of Lufkin Precision Tools.

Indicating Diameter in Lathe.

In use with Surface Gage.

In use with Height Gage.

BUY THROUGH YOUR DISTRIBUTOR

NEW YORK
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THE LUFKIN RULE CO.
SAGINAW, MICHIGAN

Canadian Factory
WINDSOR, ONT.

TOOL MATERIAL TREATMENTS

(Continued from page 13)

ends ground, and the dies matched. The inserts are held in the adapter by shrinkage. This method consists of heating the adapter to 900° F., then dropping the insert in the recess and allowing it to cool. The recommended allowance for shrinkage is .0015 per inch in cross-section. The contraction of the adapter holds the insert firmly. A minimum test load of 100,000 pounds is applied to the insert after shrinking. Unless it meets this test the hammer die is rejected. However, shrink method of holding inserts in hammer dies has been applied to more than a thousand sets without a single failure.

After the die is worn out, it is heated to 900° F. and set in a fixture that permits only the insert to be exposed.

A stream of water is turned on the insert, the contraction of the metal in the insert allows it to drop out of the adapter. Sometimes a slight tap with a hammer is necessary to remove it. By this method inserts are interchangeable, thus saving cost of making new adapters for every set of dies. Adapters for the upper part of the hammer can be used 6 times and those for the lower adapter up to ten times. Insert dies are used for making all connecting rods and connecting rod caps, as well as a number of other parts. The average number of forgings made from an inserted connecting rod die is 20,000 while the connecting rod cap averages 50,000 pieces.

Trimming Dies

Trimming dies can be classified into two types: cold and hot. When a cold forging with a light flash is to be trimmed, chrome non-shrink steel has been found to give good results. This material is recommended because a light flash does not require a great amount of pressure to trim, therefore a sharp cutting edge is maintained over a long period of time, giving longer die life. Heat treatment of this steel is as follows: preheat to 1250° F., superheat to 1850° F., cool in air, draw at 1050° F. Brinell 512.

When trimming a heavier cold flash, Ford type "R" steel has been found satisfactory. Because the flash is heavier more pressure is required to trim the forging, which also requires a trim die made of a tough and good-shearing quality steel. These qualities are found in "R" steel. Heat treat to Brinell 555.

When trimming heavy hot flash, Ford hot work steel, welded with Stellite gives exceptionally good results. This type of trimming requires a material that will resist the heat of the forgings, keep a cutting edge and be tough enough to withstand the pressure of trimming.

Shear Blades

For cold shearing billets, plates, sheet metal, etc., we use our type "R" steel heat treated to a Brinell of 477-555. With this hardness range, blades give satisfactory results. However wet grinding is necessary to prevent grinding check, which in this case causes chipping or spalling off of the cutting edges.

Type "CC" steel and hi-carbon-hi-chromium steel gives exceptionally good results. The latter is especially good for light gauge metals.

Hot Shear Blades

We use blades of semi-high speed steel on our hot slab shear for shearing hot billets. It is heat treated to a Brinell of 364-387. This type of steel has proven excellent for this purpose when the Brinell hardness does not exceed 387; otherwise if the water used to cool the shear guides comes in contact with the blades it causes breakage.

NEXT MONTH

Watch the next issue of "The Tool Engineer"— it will be a very important number. What should the life of a plug gage be? and, how to measure surface finish, the flame hardening of gears, and an article on plastic dies are among the subjects to be covered.

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DUMORE

DOES THE "IMPOSSIBLE"

Love Brothers, specialists in mammoth job-shop work at Aurora, Illinois, had a "headache" . . . but not for long. In grinding several 43-inch cast iron strainer cores on their 16 ft. vertical boring mill they were unable to maintain correct taper or obtain satisfactory finish . . . until an industrial distributor heard of their problem. A Dumore No. 12* grinder was suggested for the job. In a test set-up perfect taper and a mirror-like finish were obtained in half the former time. Right in your own shop no doubt there are tool room or production jobs that could be done better, faster and cheaper with a Dumore Precision Grinder. It costs nothing to find out . . . the services of any Dumore Distributor are yours without obligation. Write today!

THE DUMORE CO., Dept. 228-J RACINE, WIS,

**Capacitor motor develops one h.p. . . . spindle speeds from 2,800 to 8,200 r.p.m. . . . grinds to accuracy of a tenth (.0001).*

PERFECT FIT IS ESSENTIAL IN MILLIONS OF INDUSTRY'S ASSEMBLING JOBS . . . FOR A SMOOTH INSIDE FINISH, HELD TO CLOSE TOLERANCES, SPECIFY MORSE REAMERS.

MORSE

THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE STREET - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

PRODUCTION PERSPECTIVES

(Continued from page 30)

Co. is building a brick addition, to cost $32,000, at its Homestead avenue, Hartford, plant. **Unique Tool Corp.** has been **organized in Waterbury by Frank and Edgar Gravell and Ernest Bowman.** George A. Prior, 68, one of the founders of the Gray & Prior Machine Co., Hartford, builders of special machinery, tools and engines, died August 1. He was widely known as a designer of automobile and marine engines in the early days of those industries.

Midwest and South

Robert M. Watkins, Superintendent of the **Springfield Motor Truck Works** of the International Harvester Company, announced that **approximately 2,000 of the company's** Springfield **employees returned to work August 15.** Mr. Watkins indicated a regular **production schedule of 750 trucks weekly will be resumed** but declared that future plant activities will depend entirely on sales maintenance, which, he added, will depend upon continuation of improved economic conditions.

The **Youngstown Sheet and Tube Company, registering a $30,000,000 securities issue, announced plans August 15 for a $17,500,000 plant improvement program; $16,500,000 worth of construction is planned for the Indiana Harbor plant** and **$1,000,000** at the **Campbell plant.** At Indiana Harbor the company proposes to build a new open hearth, improve present open hearth furnace, rebuild the blooming mill, to build a new 48-inch continuous hot-rolled sheet and strip mill and to build a new continuous cold-rolled tin mill. At the Campbell plant improvements in the wire and tube mills are proposed.

At Troy, Ohio, work is being rushed at the Miami Specialties, Inc., local **assembly plant on 200 new school buses contracted by the Union City Body Company. At Toledo,** it was reported **that price reductions ranging as high as $26.00 were announced recently by Willys-Overland Motors, Inc.,** to cover current and future production of 1938 cars at the factory. **Cooper Bessemer Corporation announced** that due to limited orders, **operations at the Mt. Vernon, Ohio, plant would be suspended September 1.**

Another of the **Ford "village industries" has begun operations in Milan, Michigan,** in a small plant which has been employing about thirty workers manufacturing ignition coils and processing soy beans. **Foundations have been laid for another soy bean extraction plant.** The regular process of flaking the beans and extracting the oil will be followed, with the residue to be transported to the Rouge plant.

At Louisville, Kentucky, **C. R. Hale, chief clerk of the Ford Motor Assembly Plant there, said** August 16 **that approximately 1,000 men were at work and that the plant normally employing 2,000 had been shut down for two weeks prior to August 15** "to permit vacations for men and department heads." The **output now is 125** cars per day **while the normal output is said to be 424 automobiles a day.**

From Grand Rapids, Michigan, comes the news **that a government contract for construction of 500 rear assemblies for torpedoes is about to be started by the Hayes Body Corporation there.** The local firm was given the contract after developing a rear-end housing and assembly regarded as considerably better than those now in use.

At Racine, Wisconsin, funeral services for David Merrill Averill, a pioneer automobile executive, **who died July 17, were held at Racine, July 19.** Averill started his career with the old Durant-Dort Carriage Company in Michigan, worked for Chevrolet when it was headed by W. C. Durant and **until his retirement because of ill health a year before his death was works manager of the Racine and Kenosha Nash plants.** He is survived by his widow and two daughters.

To fill booked orders, **the Stewart-Warner Corporation has stepped up production of its gasoline-burning automobile heaters to 2,400 a day, according to F. A. Hitter, vice president. On June 30 four times as many heaters** had been **shipped as on the same day of last year, he said.**

Construction of **a new Detroit factory and general offices for the Carboloy**

(Continued on page 41)

3 JOBS
3 FIXTURES
but only
1* Broaching Machine

***Colonial Utility Broaching Press**

Above: **Broaching external teeth on a synchronizer ring.**

Center: **Spiral broaching of oil grooves on guide bushings.**

Below: **Broaching roller bearing cages for Diesel trains.**

Just one Utility—or Light Duty—Broaching Press may solve a dozen or more machining problems in your shop—better, quicker, and cheaper. Usually another job means just another fixture and broach.

This flexibility is the reason why manufacturers with job-lot problems find one of these Colonials just about the best investment they can make.

Send for Bulletins No. 104-9d and 104-9e

COLONIAL BROACH COMPANY
147 Jos. Campau Detroit, Michigan

COLONIAL BROACH COMPANY, 147 Jos. Campau, Detroit, Mich.
Please send further information regarding your Utility and Light Duty Broaching Presses and bulletins Nos. 104-9D and 104-9E.

NAME .....

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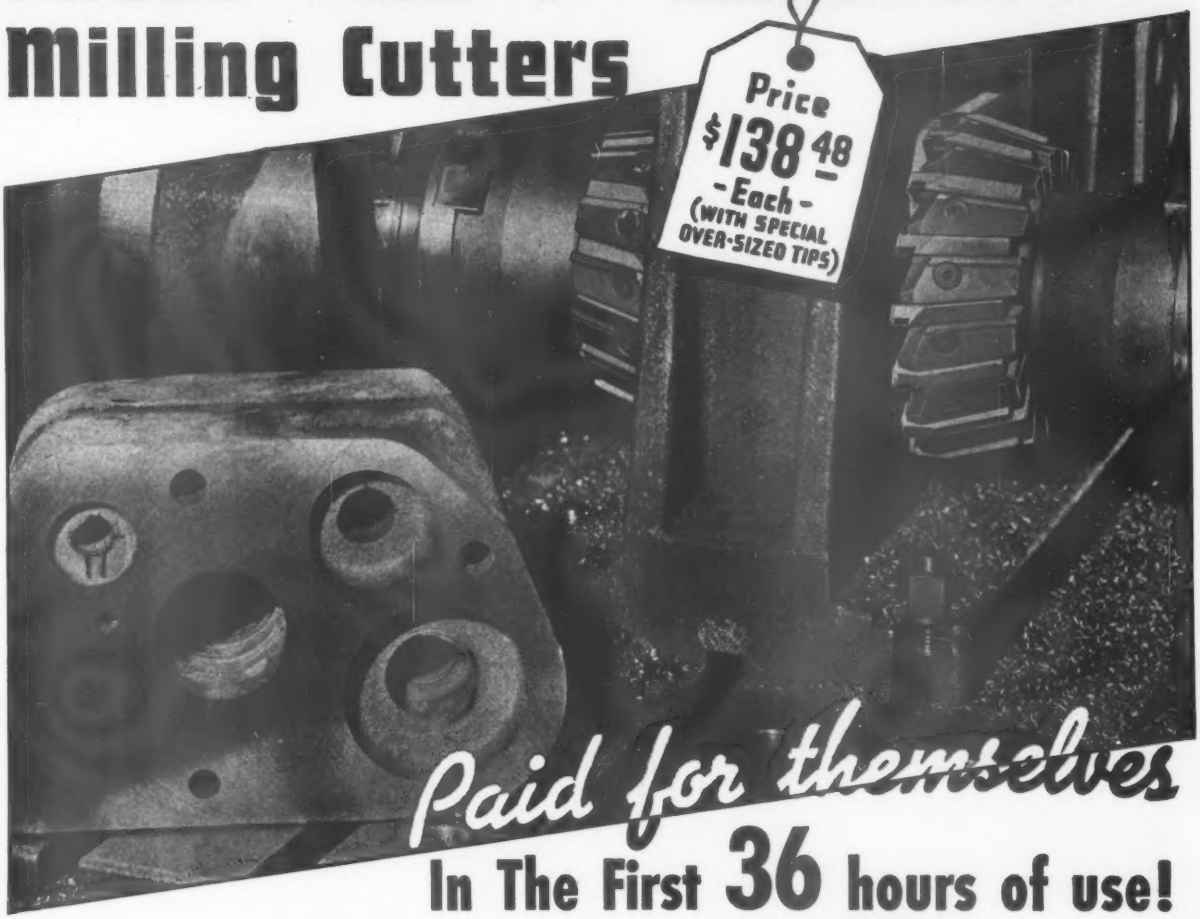
These TWO 7" CARBOLOY Milling Cutters



Paid for themselves

In The First 36 hours of use!

THE price you pay for Carboloy tools comes back *fast!* Whether it's a $2.23 single point tool or a $138.48 milling cutter, your money is returned in cost-saving dividends within a remarkably short period.

Take the above example: Two 7" Carboloy cutters were ordered by a Pennsylvania plant to mill cast iron valve bodies. They cost $138.48 each or a total investment of $276.96.

In the first 36 hours of use, these cutters paid for themselves in lower tool costs, decreased down-time, less grinding time and lower machining time. Since then, these Carboloy cutters have paid a 6% dividend ($16.62) on the original investment after each 2-1/6 hours of use... not 6% a year—(a good return on *any* investment) BUT 6% every 2-1/6 hours!

Now pay a 6% ($16.62) DIVIDEND every 2 1/6 hours

.. Now Save $1,607 per month

You need these additional profits NOW. . . . more than ever before. Get the FACTS!

CARBOLOY COMPANY, INC.

CHICAGO • CLEVELAND • DETROIT • NEWARK • PHILADELPHIA • PITTSBURGH
STAMFORD, CONN. • WORCESTER, MASS.

Canadian Distributor: Canadian General Electric Co., Ltd., Toronto

CARBOLOY
REG. U.S. PAT. OFF.
CEMENTED CARBIDE TOOLS

Carboloy Co., Inc., 2983 E. Jefferson, Detroit, Mich.
We'd like complete cost saving data for Carboloy on the following job

_____

Name_____ Title_____

Company_____

City_____ State_____

NEW *Equipment*

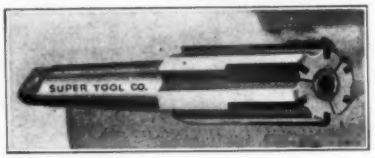
Multiple Spindle "Bearing-izing"

A multiple spindle machine for "Bearing-izing" three valve lifter bores in engine blocks, has recently been developed and built by Cogsdill Twist Drill Co., 6519 Epworth Blvd., Detroit, Michigan. It has a main headstock mounted on the top of a vertical travelling hydraulically operated ram. On this headstock are mounted three precision spindle units and the driving motor.

The cylinder blocks come off the line directly onto a conveyor section built into the machine from which they are picked up by air operated plungers entering the camshaft bores. Movement of a control lever opens the hydraulic system to start the ram down at a rapid advance until a cam engages the feed control valve to produce the desired feed of the tools through the bore. Reversal of this control lever returns the ram to top position through the feed mechanism and then the rapid stroke section of the ram travel. The spindles operated at a speed of 2500 R.P.M. drive the bearing-izing tools so as to produce, by the cam actuated peening rolls, approximately 200,000 blows per minute on the surface of the bore. It is claimed that these sharp blows drive down the "peaks" left by the reaming operation, condense and work-harden the metal leaving a burnished finish which ideal for lubrication and highly resistant to wear and corrosion.

Reaming With Carbide Tipped Tools

Super Tool Company, 356 E. Congress St., Detroit, Michigan, are now carrying a stock of standard sizes of Carbide Tipped Solid and Expansion Reamers. They are also prepared to furnish special tipped reamers in single or multiple diameters.



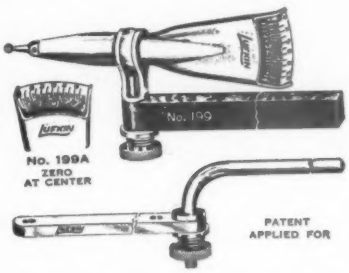
Prices on Super Tool Standard Reamers are available on request.

LeBlond Cutter Grinder

R. K. LeBlond Machine Tool Company, Cincinnati, Ohio, announced their new No. Cutter Grinder, which according to a bulletin issued by LeBlond, is the first really universal cutter grinder. Seven distinct new features are claimed for the machine.

New Lufkin Universal Indicator

Lufkin Rule Company, Saginaw, Michigan, has just announced their Universal Indicator No. 199.



Among its unique and valuable features is the location of the reading faces. As illustrated above, one of these is on its front or flat side, the other on the end or top, making this Indicator especially suitable for jig boring, milling machine and drill press work. In such work, the end graduation makes possible reading without a mirror. Also when used with a Surface Gage and Vernier Height Gage, an dreading is the convenient way. Users of Indicators will instantly recognize that end reading is most natural and handy in a great many of the applications of this tool to its work.

Indicating Micrometer and Comparator

The George Scherr Company, 128 Lafayette Street, New York City, has just introduced a new Indicating Micrometer and Comparator with important improvements. Among these are the elimination of all gears and racks from the indicator mechanism. The knife edge lever type is used which, it is claimed, makes the instrument more accurate, and more durable. It is also claimed that this eliminates the uncertainty of measuring feel since it includes a feature which makes the measuring pressure visible. Thus, no matter who does the measuring, the reading is said to be the same, as measuring feel does not enter into it. In the "Compar" Indicating Micrometer and Comparator all delicate mechanism has been eliminated which has resulted, it is said, in a compact, sturdy instrument that measures in 1/10000" and is built for hard all around use.

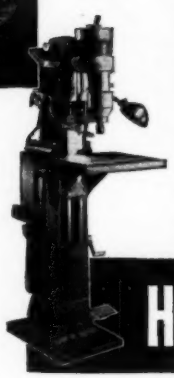
"Strenes" Metal

Strenes Metal has been marketed for several years in the area surrounding Dayton, Ohio, where is located The Advance Foundry Company, the manufacturers. This metal is said to be outstanding die and abrasion resisting alloy having a great many uses. It has been and is being used more and more for forming and drawing dies of all types and has many applications where resistance to abrasive action is vital. Actual manufacture of this metal is secret and there are no licensees. Strenes products are not made according to the same rigid formula in every case, instead the melt is varied slightly to obtain the qualities necessary for the particular job. Remarkable results from the use of Strenes as a die metal have been obtained —one example is 850,000 stampings out of .050 material and the die still in excellent operating condition.

An important part of the Haskins Method is the designing of fixtures that insure the user maximum profit from the exclusive advantages of the Haskins Tapper.

FOR EXAMPLE

Tapping brass back plates of an electric automobile clock to extremely close tolerances. A simple slide fixture, designed by Haskins Engineers, and the sensitive Haskins tap head, eliminating the necessity of a hold-down, more than double production. The fixture moves in a fixed guide against stops at both ends so that the operator need not line up the holes for tapping.



Tapping jobs of practically all kinds are now being done faster and more economically because of these two factors — skill and experience of Haskins Engineers — speed and precision of the Haskins Tapper. Would you like, without obligation, to see PROOF of how the Haskins Method can improve tapping production in YOUR plant? Write to R. G. Haskins Company, 2756 W. Flournoy Street, Chicago, for full details.

HASKINS PRECISION *Tapping Equipment*

Wetmore Units are adaptable to bars, boring and turning heads.

WETMORE

CUT MACHINING TIME AND COSTS WITH THE WETMORE UNIT

Note these exclusive, patented WETMORE Features:

—eliminates present slow, costly, unreliable methods of adjustment.

—provides rapid, accurate adjustments in either direction with graduated screw.

—wedge lock positively and solidly locks tool without changing setting.

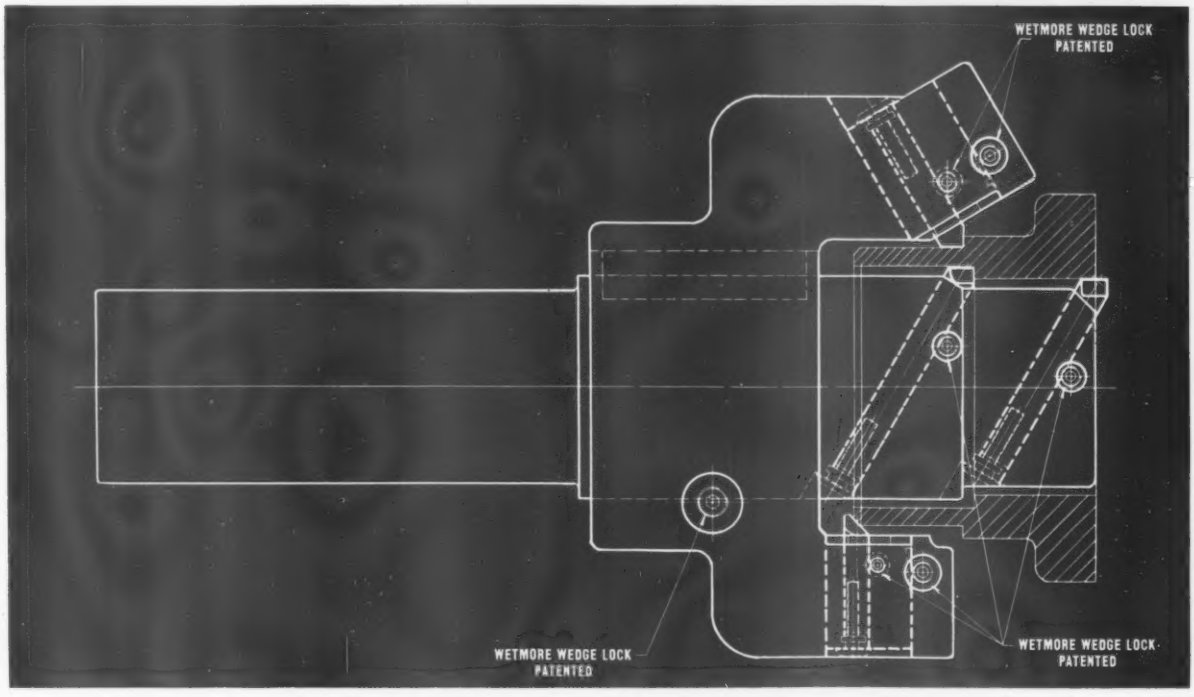
—rugged construction of unit and firm grip of cutting tools by wedge lock adds to cutting life by elimination of vibration.

—adjustment and wedge lock adaptable to all types of speed bars.

* * *

Send in your drawings—Wetmore Engineers will design tools to reduce tool-setting time and cost per piece machined.

See your Wetmore representative for many surprising possibilities and applications.



The diagram illustrates the Wetmore Boring Bar Unit applied to special boring bar with cat-head for turning and chamfering.

WETMORE REAMER COMPANY

Dept. TL 420 N. 27th St. **MILWAUKEE, WIS.**

MEETING TO ATTRACT THOUSANDS

(Continued from page 11)

ties for the manufacture of large forgings, including crankshafts, connecting rods, line shafting, turbine shafts, generator shafts, pinion and gear blanks, paper and sugar mill shafts, ship shafting—in fact, all those hammer and press formed steel shapes commonly referred to as forgings. Also to be seen is the making of die blocks and drop forged accessories, shear knives, forged specialties of all kinds, acid open hearth and electric induction steels including the Heppenstall Alloy Acid Open Hearth. Another plant, located some fifteen miles up the river, at McKeesport, is the Firth-Sterling Steel Company, makers of "Firthite," sintered carbides —"man's hardest metal." A visit to this plant will present an opportunity to see "The largest building in the country, built especially for and devoted exclusively to, the manufacture of tungsten carbide tools and dies." Another point of interest which all Tool Engineers, generally, will not want to miss on their visit to Pittsburgh, is the internationally famous Mellon Institute, scientific laboratory devoted to all manner of scientific research. This new building with all it represents is devoted to the service of the public good. To the founders, Andrew W. Mellon, and Richard D. Mellon, the institute is indebted for constant interest and support since the beginning of its fellowship system. They realized clearly that, to raise the general level of material and intellectual existence, able scientists must be provided with adequate facilities for research, and they believed firmly that an independent scientific institute with the sole aim of searching for those truths that are essential to industrial progress and human welfare, would be the highest type of useful gift to the nation. The Mellon Institution provides, therefore, a carefully chosen group of scientists to live and to work and to add to the enrichment of civilization. Of particular note to the Tool Engineer is the fact that the Mellon Institute, as well as providing a station for research in pure and applied science, and a school for the training of research workers, is essentially a clearing house of technical information.

A plant that probably every Tool Engineer who visits Pittsburgh during this Semi-Annual Meeting will want to see is the United States Steel Company's new $6,000,000 plant, just completed at Erwin, Pennsylvania—a short trip from downtown Pittsburgh.

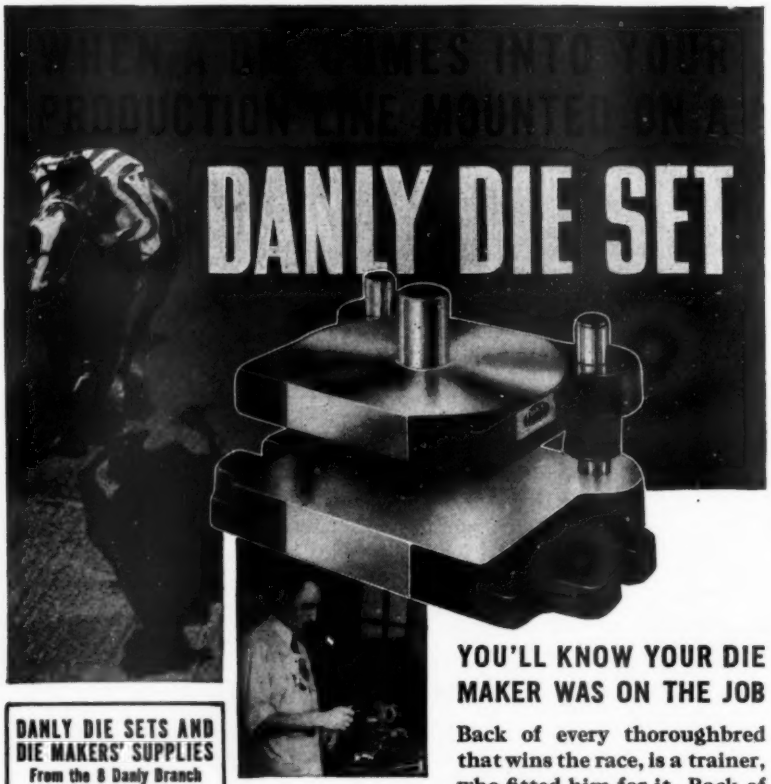
See and Learn—Enjoy Yourself at the Same Time

If you have never visited Pittsburgh, this is your big opportunity to do so at very nominal cost. Your chapter or a chapter near you is arranging all the details now for a most inexpensive pleasant sojourn to this meeting. Detroit Chapter, as an illustration, has already tentative plans made for at least three hundred members to make their "All Expense Trip" at a cost of not more than $15 including railroad fares, hotel accommodation in Pittsburgh, semi-annual dinner, meals in Pittsburgh, etc. (all expense). There will be an equally attractive rate for all chapters. Be sure to contact as early as possible chapter officers for further details, costs, etc. Then, plan, now, to be with us and to enjoy yourself and to avail yourself of the many splendid "treats" which have been planned for your entertainment and instruction.

Tool Engineers of the TRI-CITY Area

Tool Engineers of Rock Island, Moline and Davenport and nearby area who desire to affiliate with a new chapter of the American Society of Tool Engineers being established there, are cordially invited to communicate with New Chapters Chairman,

Roy T. Bramson
2842 West Grand Boulevard
Detroit, Michigan



DANLY DIE SETS AND DIE MAKERS' SUPPLIES
From the 8 Danly Branch Office Stocks

BRANCHES:
LONG ISLAND CITY, N. Y. 36-12 34th STREET
DETROIT, MICHIGAN 1549 TEMPLE AVENUE
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PHILADELPHIA, PA. 3913 N. BROAD STREET
ROCHESTER, N. Y. 16 COMMERCIAL STREET
MILWAUKEE, WIS. 513 EAST BUFFALO STREET

YOU'LL KNOW YOUR DIE MAKER WAS ON THE JOB

Back of every thoroughbred that wins the race, is a trainer, who fitted him for it. Back of every die is a die designer, a die maker, a tool room, a tool and die shop that builds that die for production work.

The fine precision of Danly Die Sets means that dies mounted in them will produce with greater accuracy, give longer life between grinds, and freedom from shearing and breakdown.

DIE BUYERS—Specify Danly Die Sets for Your Dies
DIE MAKERS—Include Danly Die Sets in your estimates
It will be good business for you both

DANLY MACHINE SPECIALTIES, Inc., 2114 So. 52nd Ave., Chicago, Ill.

DANLY PRECISION DIE SETS

STRENES METAL

LICENSED TO NO OTHER FOUNDRY

There's a reason why we have consistently refused to license the manufacture of cast-to-shape Strenes metal. Frankly, experience has shown that licensee foundries are unable to make any metal as good as can the licensor. Whatever the reason . . . lack of skill, equipment, proper care, or sufficient knowledge . . . a licensed metal still has this definite handicap.

Knowing this, Advance Foundry makes the entire output of Strenes metal. By so doing we are able to supervise *every* melt . . . to make sure that each is of that high quality which has made Strenes a valuable and increasingly popular die metal.

Why YOU Can Profitably Use Strenes C —(formerly 71-C)

Drawing and forming dies of Strenes metal are 30% to 50% less expensive. Not only is the metal itself less costly, but casting it to shape (to surprisingly accurate limits) gives additional savings. Strenes dies virtually eliminate the need for Kellering, machine finishing, and the use of steel inserts.

Strenes dies require only ⅓ to ⅙ the stoning and polishing of higher priced die metals (taken from actual records) because they don't gaul or "pick-up." And due to the deflection factor of .23, they don't break.

Long life is another Strenes metal characteristic. A typical example is a refrigerator top die which produced 1,350,000 stampings out of .050 material and still remained in excellent condition. Strenes dies produce few imperfect stampings because of the unexcelled graphitic surface lubrication (especially noticeable on difficult draws).

Used in Many Fields

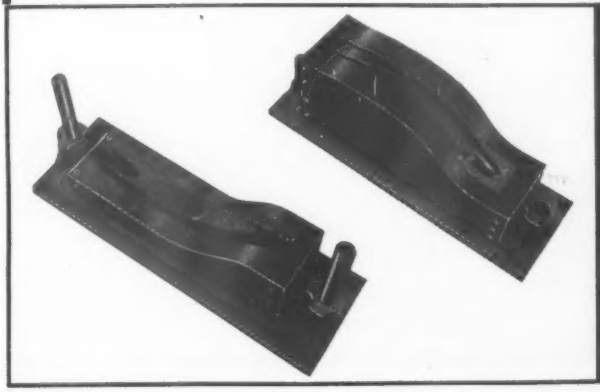
Cast-to-shape Strenes metal is hanging up new economy and performance records in field after field. It is being successfully used in over ***one half*** the automotive companies for a wide variety of forming and drawing operations. Refrigerator, farm implement, and stove manufacturers also are enthusiastic users. And the chances are that Strenes can be of great service to ***you.***

Look Over This Guarantee

So confident are we that Strenes C (formerly 71-C) will fully meet your most rigid requirements that we will make your die ***on trial.*** Send in your blueprints or patterns for preliminary estimates. But whether you do this or not, write for free descriptive bulletin. ***The Advance Foundry Company,*** Dayton, Ohio.

LONGER WEAR
STRENES
AND NO REPAIR

Representatives: W. R. McDonough & Co., National Bldg., Cleveland, Ohio • F. W. Peterson, 7310 Woodward Ave., Detroit, Michigan Fred H. McGee, 917 Carter St., Chattanooga, Tennessee • Gilbert T. Osborne, 6037 Park Ave., Indianapolis, Ind. William F. Quinn, 5812 Malvern Ave., Philadelphia, Penna. • H. L. Ayres Machine Co., Box 45, Columbus, Ohio • A. G. Raddatz, 1922 Peck St., Muskegon, Mich. • Rex Sales Company, 919 S. Keeler Ave., Chicago, Ill. • W. H. Soward, Southwestern Ohio, 720 Superior Ave., Dayton, Ohio • R. C. Hubert, 208 Furniture Bldg., Evansville, Ind. • E. J. Walker, 2221 Arts Bldg., Toledo, Ohio.



SCOOTER FOOTBOARD DIE SET

Cast-to-shape out of Strenes C (formerly 71-C). 32"x3½" stamping drawn from a develop blank. 1/16" material. 1½" draw with beads drawn from 1/16" to 5/16". Designed and built by the Lincoln Eng. & Tool Co., Dayton, O.

Q-C ENGINEERING

Q-C BORING FIXTURE
(EQUALIZING)

STANDARDIZATION

Can be the foundation of efficient tooling and a means of reducing costs.

"Q-C" STANDARDIZED UNITS

Far exceed any other means to this end.

The "Q-C Tool Engineers' Reference and Standards Book" furnishes complete engineering data.

You may secure this valuable aid gratis.

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Q-C ENGINEERING PRODUCTS

6666 TIREMAN *Designers, Builders Dies, Jigs, Fixtures, Special Machinery* **DETROIT, MICH.**

ZEISS

CARL ZEISS JENA

Toolmaker's Microscopes

For threads on gages, and parts in production, hobs, circular and flat form tools. Invariably sharp definition of image, checked against master contours. Inter-changeable oculars with templates or protractor reading to .0001 in. and 1 min. of arc, respectively. Projection equipment can be attached.

Catalog Fe 121 Upon Request

CARL ZEISS, INC.
485 Fifth Avenue, New York
728 So. Hill St., Los Angeles
Representatives in Principal Cities

Illustration shows checking of a tap. Magnification 30x. Other magnifications available are 10x, 15x and 50x.

PRODUCTION PERSPECTIVES

(Continued from page 34)

Company, manufacturers of cemented carbide tools and dies, was started August 10. The **new plant, costing about $700,000,** is to be located on the north side of Eight Mile Road, north of Detroit, located one-half mile east of Van Dyke. **The new plant will bring under one roof the entire manufacturing facilities of several plants now located at Cleveland, Ohio, Stamford, Connecticut, and Detroit. According to W. G. Robbins, President of** Carboloy Company, **the plant will be ready for occupancy about January 1, 1939. Approximately five hundred persons will be employed** when the organization is operating **at full capacity.**

R. G. Haskins Company, manufacturer of flexible shaft equipment and high speed tapping machines, **have moved to their new building at 615 South California Avenue, Chicago. The move** to larger quarters, it was said, was **necessitated by the need for additional manufacturing facilities.**

The **Woolery Machine Company, Minneapolis, have announced a new air conditioning unit for small homes.** It is revolutionary in design, it was claimed, and is called the "Woolery 100." **According to H. E. Woolery, the object in designing and building this "100" model was to supply the great medium priced home market** with an air conditioning heating plant low enough at first cost so that every home owner could afford it.

NOW JOHANSSON RECONDITIONS 2, 3 and 4-INCH BLOCKS

Reconditioned Johansson Gage Blocks have been available in sizes 5-inch and larger. Now, by a new, exclusive process, they can be reconditioned also in sizes 2, 3 and 4-inch. A degree of accuracy equal to that of new blocks is guaranteed. Reconditioning practically doubles the life of the blocks. The cost is only 50% of the cost of a new block—25% of new-block cost for blocks 5 inches or larger. The usual 20 cents an inch inspection charge will be made. Reconditioned blocks will be returned to owner in about two weeks if the blocks are not too badly worn to be reconditioned. Blocks may be reconditioned a second and third time.

This new Johansson achievement greatly reduces replacement expenses. Only Johansson offers this saving. It is a fact to bear in mind when buying gage blocks. For complete information, including prices, on Johansson Gage Blocks and Accessories, fill out and mail the coupon.

FORD MOTOR COMPANY
JOHANSSON DIVISION, DEPT. J
DEARBORN, MICHIGAN
Please send me, free, Catalog No. 12

Name_____

Addres _____

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JARVIS SENSITIVE and HIGH SPEED TAPPERS

9 EXCLUSIVE FEATURES

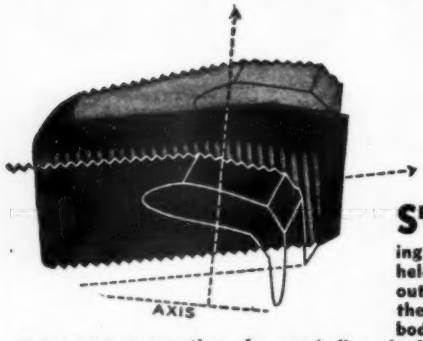
1. All spindles running in standard ball bearings.
2. All revolving parts lubricated by oil bath.
3. Mechanical labyrinth oil seal to keep oil inside tapper.
4. Overflow plug makes oiling easy and over-oiling impossible.
5. All parts are interchangeable including actual frictions.
6. Tap Chuck automatically goes into neutral when frictions are not engaged.
7. Double reverse speed with forward and reverse friction.
8. Adjustable side rod with spring lock.
9. Positive drive single purpose collet chuck, light in weight, extremely accurate. Collets available for all taps, sizes from No. 2 to ¾".

Send for NEW illustrated Catalogue

The CHAS. L. JARVIS Co.
MIDDLETOWN CONN.

Automatic Radial & Axial Adjustments

MORE USABLE BLADE



NO PINS
NO WEDGES
NO SET SCREWS

SERRATED blades, tapered toward the bottom, fit into mating slots in cutter body—there held in an immovable grip without pins, wedges or screws. As the slots are on an angle to the body, when the blades are set out one or more serrations for regrinding, both radial and axial adjustments occur at the same time, automatically. These new face milling cutters are available for either roughing or general milling, or for finishing.

(ROUGHING) (FINISHING)

Write for Circular on the Improved—

DUAL ADJUSTABLE CUTTER

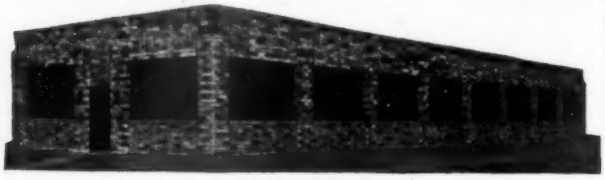
MANUFACTURED ONLY BY THE O K TOOL CO., SHELTON, CONN.

INSERTED-BLADE METAL CUTTING

TRADE OK MARK TOOL SYSTEM

Quality Tool & Die Co.

INDIANAPOLIS Est. 1929 INDIANA



OUR NEW MODERN PLANT

JIG BORING

AT REASONABLE PRICES
ON OUR NEW PRATT & WHITNEY
JIG BORER, 18" x 36" CAPACITY

LET US QUOTE YOU

DESIGNERS & BUILDERS OF

DIES — JIGS — FIXTURES

SPECIAL MACHINERY

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THE UTILITY SLEEVE

Removable Taper Shank

TOOL DRIVER

CUT SMALL TOOL COSTS

SIMPLE, POWERFUL, POSITIVE, ACCURATE.

For:
TAPS
DRILLS
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COUNTERSINKS
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WOODRUFF CUTTERS
TAPER PIN REAMERS, ETC.

THE J. C. GLENZER COMPANY

Detroit, - - - - - Michigan

SWARTZ – STANDARD FIXTURES ARE FURNISHED IN SPECIAL HEIGHTS TO SUIT YOUR REQUIREMENTS. EXPENSIVE FIXTURES NEED NOT BE DESIGNED TO HOLD TALL PARTS FOR DRILLING.

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ASK FOR CATALOG 238G

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5259 WESTERN AVE. DETROIT, MICH.

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Tulsa, Okla.—Brammer Machine & Tool Service Co. Inc.

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Chicago—Ernie Johnson

Canada—Hi-Speed Tools, Ltd., Galt, Ont.

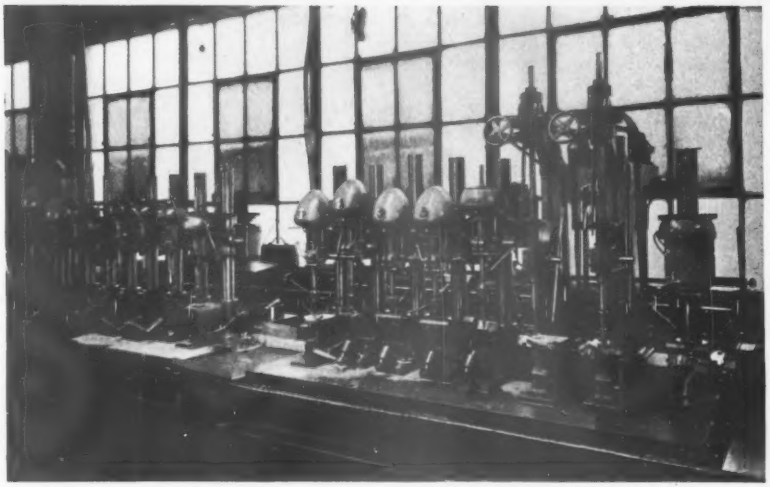
Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

How Up-to-Date Shops *CUT THEIR PRODUCTION COSTS*

A 14-Spindle Set-Up At a Fraction of the Cost of Two 6-Spindle Machines

No claim is made that light tools will replace heavier machines on many classes of work. But there are many operations where Delta low-cost drill presses will not only perform as well as heavier, more expensive machines, but will actually out-perform and out-wear heavier machines due to their more modern design, including "sealed-for-life" New Departure ball bearings throughout.

Low first cost, lower operating costs, lower maintenance costs plus remarkable flexibility and adaptability are some of the reasons thousands of manufacturers, large and small, are turning to Delta Tools. Find out how Delta Tools can reduce YOUR production costs.



Send for literature giving full details on the Delta drill press line, and the name of the nearest Delta dealer.

DELTA Mfg. Co. 677 E. Vienna Avenue, Milwaukee, Wisconsin

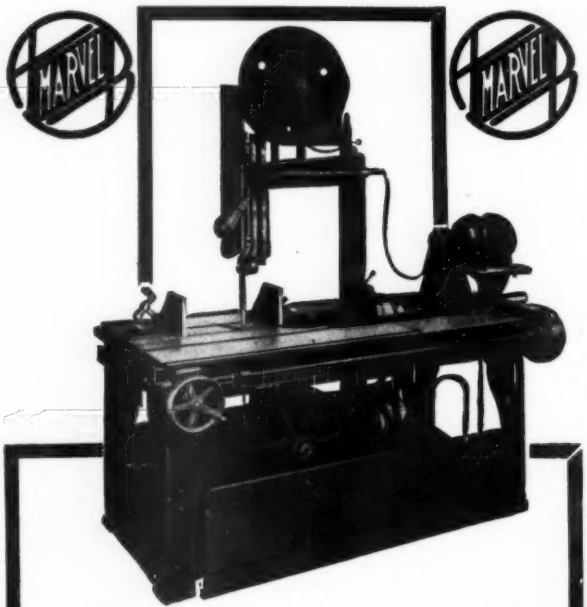
MARVEL

Keep PROFITS at Home With a MARVEL No. 8

Not only will a MARVEL No. 8 save hours of machining time, roughing-out work; not only will it make all types of straight and angle cuts, notching, coping, mitering, and an unlimited variety of work without special setting up,—it will also keep profits at home, that without it go outside. With a MARVEL No. 8 you can cut your own die plate sizes from large stock billets, etc.,—and turn "warehouse cutting extras" into extra cutting profits. With a No. 8 you can handle big work up to (18 x 18) and small work to the finest drill rod with equal ease. Equipped with both power and hand feeds, the blade is fed through the work (work remains stationary on table). Column tilts either right or left to cut at any angle to 45 degrees. Automatic knock-off stops machine at any depth of cut desired.

The most economical saw built, the MARVEL No. 8 fills a definite place in the MARVEL line, the most complete line of metal sawing machines.

Write for bulletin 800-A



ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5750 Bloomingdale Ave., Chicago, Ill.

New Literature

of Interest to the Tool Engineer

Rockford Machine Tool Company, Rockford, Illinois, have recently issued a four page circular describing their Hydraulic Slotter, 20" rating, 36" stroke. Several photographs, a large diagram and complete specifications are given.

●

Jones & Lamson Machine Company, Springfield, Vermont now have available a new 20-page circular describing and illustrating the "J & L Thread Grinding Machine" and attachments. The catalog describes the machine and attachments and the various forms of threads which can be ground.

●

The Holo-Krome Screw Corporation, Hartford, Connecticut, have issued a new pocket size catalog, 40 pp. of data, tables, Standards, and applications of value to users of socket head cap screws, socket head stripper bolts and hollow pipe plugs.

●

Vacuum Cup Metal Pulley Company, 12536 Grand River, Detroit, Michigan, issued a bulletin, describing their vacuum cup pulleys, the 10 points of superiority of this type pulley, the principle of the vacuum cup etc. A 30 day free trial offer is made.

●

Barber-Colman Company, Rockford, Illinois have issued an excellent bulletin on their new hydraulic Hobbing machine. It is said this is the first hobbing machine in this country to have hydraulic actuation of its elements. Other advantages and features are adequately described and illustrated. Dimensions and specifications are given.

Barber-Colman have also issued a new circular describing their Type S "Automatic Hobbing Machine"—for high speed continuous hobbing of spur gears and pinions for small precision instruments. Full details are given.

Latest Bulletin to be issued by Barber-Colman Company is on "B-C Combination Reamer, Hob and Cutter Sharpening Machine." This new machine has many advantages, but it does not replace the older B-C automatic machines which are more suitable and economical for large-volume production. Many pictures are shown with full details of this new development.

●

Dayton-Rogers Mfg. Company, Minneapolis, Minn. have issued an ingenious little "Calculator." This, pocket size device will calculate, similarly to a slide rule, the weights of flat steel etc. Manufacturing Executives who request on their firms' letterhead may obtain one, while the supply lasts.

●

American Technical Society, publishers, Drexel Avenue at 58th Street, Chicago, Illinois. A new book on "Metallurgy," very practical, thoroughly indexed, well illustrated, attractively bound in durable water-proof binding.

●

Blanchard Machine Company, Boston, Massachusetts have available an attractive, pocket-size, 80 page, booklet entitled "Work Done on the Blanchard." It contains over 100 illustrations with production data showing work done on Blanchard Surface Grinding Machines. Copies will be sent free to production executives only.

●

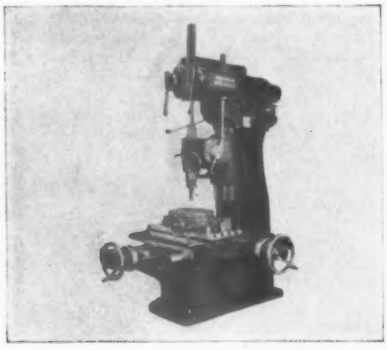
Pioneer Engr'g. & Mfg. Co., 31 Melbourne, Detroit, Mich. have compiled a comprehensive 45 p. engineering data book, based on more than 4 years of research and tests, covering Coolant and Lubricant Pumps and their correct application to machine tools and industrial processing. It is of the loose leaf type, and follows the standard data sheet procedure as adopted by the A.S.T.E. It is said of this book that more than 70% of its contents have never been published in any data or reference book previously.

"PAID FOR ITSELF IN 9 MONTHS"

Seventy-two 1" holes spaced on location to 0.001" on a 32" circle.

. . . . says a nationally known builder of special machinery whose Cleereman Jig Borer is used for a variety of purposes. It performs general tool room work and also is used for economical and accurate production of parts where limited quantities do not justify jigs and fixtures.

Cleereman Drilling Machinery includes . . . round and square column sliding head drills . . . heavy duty stationary head machines . . . gang drills . . . rail drills . . . etc. . . . Send for catalog "H".



CLEEREMAN MACHINE TOOL CO., GREEN BAY, WIS.

MANUFACTURER'S SALES DIVISION

BRYANT MACHINERY & ENGINEERING COMPANY, 400 W. MADISON ST., CHICAGO

CLEEREMAN DRILLING MACHINES & JIG BORERS

6 REASONS WHY THE BEST COSTS LESS

CHEAP TOOLS ARE EXPENSIVE TOOLS

HIGHER SPEEDS

MORE PIECES BETWEEN GRINDS

QUICKER INTER CHANGE

LESS GRINDING TIME

LONGER LIFE

LESS "DOWN" TIME

Industry has proved that Radial Drive plus multiple diameter end cutting tools mean LOW FINAL COST—extra profit on the job for you!

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ECLIPSE COUNTERBORE COMPANY
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THE UNIVERSAL

MOORE PRECISION JIG BORER

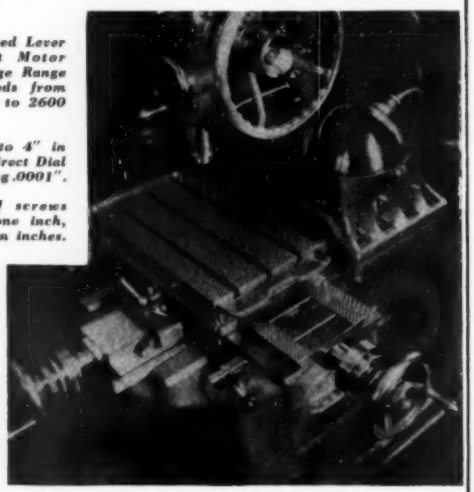
the ideal, medium-sized machine every tool shop can afford for tool-die and jig work or as jig eliminator for small lots.

Do you know that the **MOORE** is the only Precision Jig Borer equipped with **ALL HARD** 60-62 C. Rockwell **LEAD SCREWS?** Neither compensators, nor plugs or blocks or other gadgets to bother with!
With the **MOORE**, Accuracy is built **INTO** the machine, the human element left **OUT.** To set the table, say ½", simply turn the lead screw five times and you are there within .00005". Compare!

High-Low Speed Lever with Instant Motor Control—Large Range of TEN Speeds from 100 RPM up to 2600 RPM.

Capacity up to 4" in mild steel. Direct Dial Vernier reading .0001".

Accuracy of screws .00003" in one inch, .00015" in ten inches.



Let us send you our monthly illustrated Case-Letters with data and actual production figures.

Ask for catalog or demonstration

MARBURG BROTHERS, INC.
88 - 90 West Street, New York

ACME Standardized Drill Jig Bushings

Plain Stationary Press Fit—Type "P"

Shouldered Stationary Press Fit—Type "S"

Removable Slip—Type "R"

Prompt delivery from stock on over 10,900 standard items—over 6700 ACME Standard—over 4200 A. S. A. Standard—all completely finished ready for use. *Special sizes made to order.*

Made in our new plant by the most exacting and scientific methods—insuring accurate fit plus long wear — concentric within .0003" full indicator reading.

Send for bulletin containing complete data and low prices. Satisfactory service guaranteed.

Also manufacturers of complete machine parts, specializing in **hardened and ground** parts requiring **extremely close limits, lapped fits, etc;** also **hydraulic appliances** for pressures up to **20,000 lbs.** per square inch.

ACME INDUSTRIAL CO. 208 N. LAFLIN ST. CHICAGO, ILL.

Dear Mr. Rylander:

As a civic minded citizen of Milwaukee we take exception to the editorial which appeared in "Production Perspectives" of the August issue of the "Tool Engineer" regarding high taxation in the City of Milwaukee.

The article stated at length, that thirty (30) industrial firms moved from Milwaukee because of high taxes. If the editor made an impartial survey of the facts concerning this article he would have found the source of information was decidedly political.

There is no other industrial center in the country that can offer more advantageous manufacturing facilities than Milwaukee. Our labor troubles have been minor and we do not experience some of violence apparent in other industrial towns.

Milwaukee has long been known for its efficient, economical city government giving its taxpayers good service at a low tax rate. I believe that if thirty firms moved out of Milwaukee, as stated in the article, it was for other reasons than high taxes.

Perhaps this letter will allay rumors that an industrial exodus from Milwaukee is taking place.

Sincerely,
E. Houston,
Milwaukee Chapter Pub. Chairman.

Answering personally, I can neither affirm nor deny the statement, but agree that Milwaukee is considered a model city, well governed. There is, however, no evidence that it is immune to conditions affecting other industrial centers; if it were, industry would besiege its gates. As a general rule Production Perspectives may be considered authoritative, is so considered by the majority of our readers. This is the first instance where a statement in that column has been challenged.

Considering that glaring—sometimes outrageous—mistakes occur in leading publications supervised by salaried staffs, it is to the credit of the *Tool Engineer* that misstatements have been conspicuous by their absence. The occasional lapse has evoked immediate comment, proof of close reader interest. On the whole, we publish facts, and any trade journal that does not publish facts relating to its line fails in its duty to its readers.

Speaking for the editorial committee, it has been our aim to present the livest of editorial and technical matter, all consistent with sustaining reader interest and maintaining high standards of journalism. We have indisputable proof that we have not failed in that respect. But thanks for your letter, Mr. Houston; we'll talk it over at Pittsburgh next month, eh?

Yours cordially,
A. E. Rylander, Ed. Chrmn.

CHAPTER DOINGS

(Continued from page 24)

Dr. Caton has been invited once more in answer to an unprecedented demand. Numerous men who were disappointed not to hear him before will undoubtedly avail themselves of this chance. **Many plan to bring their sons,** so we take this opportunity to inform our members that **young men will be welcome** and to spread this news to those who may be interested.

Members are reminded of the change in meeting dates to FIRST MONDAYS of the month, starting OCTOBER 3rd.

Cincinnati chapter, reports T. C. Vittetow, chapter secretary, held a meeting August 10, in the air conditioned meeting room of the Lodge & Shipley Machine Tool Company through the courtesy of the officials of that organization. **Mr. Weber, chapter chairman, announced the appointment of L. L. Thill,** a Tool Engineer of Aluminum Industries, as **new Meetings Chairman, to take the place of Mr. J. B. Elfring** who was originally appointed for this office and whose duties now do not permit him to serve in that capacity. Mr. Thill made a few remarks concerning his new office and his plans for future meetings. **Two senior members have been admitted to Cincinnati chapter**—Mr. **Arthur C. Pletz and Mr. Edward M. Lear,** and Mr. **George H. Tenhundfeld**—for junior membership. Cincinnati A.S.T.E.'er **Averill, Chairman of the Entertainment Committee,** took census of the athletic inclinations of the members and it is anticipated that he will have a good strong program in this department going soon. **Mr. Charles Carr, Chairman of Standards Committee,** indicated that a report on their first assignment, **a treatise on cutting oils,** would **be ready** for **distribution** at the September meeting. Attention was also called to the semi-annual meeting of the A.S.T.E. to be held in Pittsburgh, October 14 and 15, and all members were requested to inform any of the officers of their intention to attend so that the necessary arrangements can be made. The secretary reports that the **membership of the Cincinnati chapter is now forty-two members** with nine applications in the national office as yet not reported on.

"LOGAN" FACILITIES INSURE PROMPT SHIPPING SERVICE ON MOST STANDARD ITEMS...

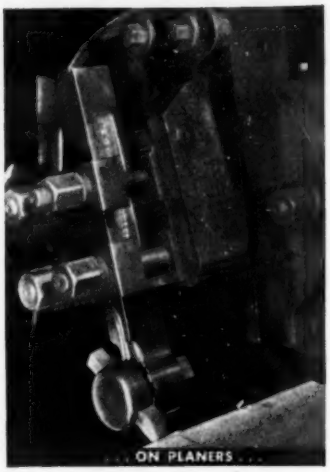
LOGAN'S policy of continuous expansion and improvement of production facilities has kept abreast of the steadily growing demand for "Logan" Products. "Logan" anticipates trade requirements by stocking finished items in all standard lines. Result: Immediate shipment on most standard items, which cuts your time losses — both on new installations and on re-tooling. When time is an important factor, call on "Logan".

LOGANSPORT MACHINE INCORPORATED
LOGANSPORT, INDIANA

Manufacturers of "Logan" Air and Hydraulic Power Devices, Chucks, Cylinders, Valves, Presses, Accessories; and "Logan" Sure Flow Self-Priming Centrifugal Pumps.

ARMSTRONG

to get all the profit
use the right
ARMSTRONG TOOL HOLDER
on every operation



The extreme strength and versatility of ARMSTRONG TOOL HOLDERS, leads in many shops to the use of a few types for all operations. While any ARMSTRONG TOOL HOLDER "Saves All Forging, 70% Grinding and 90% High Speed Steel," and, even the wrong tool holder will out perform the "right" forged bar tool . . . the very highest efficiency will be obtained only by using the correct ARMSTRONG TOOL HOLDERS—each designed for its specific work.

ARMSTRONG TOOL HOLDERS cost so little compared with the years of service they give—cost so little in comparison with the sets of forged tools each one replaces—it is a sound rule to insist that the right size and type be used for each different operation on lathes, planers, slotters and shapers. If you haven't checked over the modern Armstrong System against the tools you are using, write for a B-37 Catalog TODAY.

It is the only way to know that you are getting all the profit to be had on every operation.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG BROS. TOOL COMPANY
"The Tool Holder People"
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Eastern Warehouse and Sales:
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Investigate and Specify- Incorporate - - - And They'll Satisfy

KNU-SINE
UNIVERSAL ACTION TOGGLE CLAMPS

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3 Distinct Sizes
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SALES AGENTS IN PRINCIPAL CITIES

THE M-B

COMBINED AUTOMATIC AIR LINE FILTER AND LUBRICATOR

First removes from 96-97% of water, dirt scale, etc., in air line, then delivers a mist of oil into the clean air going through the bearings of air tools

Removes the guess work from the matter of lubrication of air tools. Smooths tool operation, eliminates costly shut downs, and lengthens tool life.

EACH UNIT OF THIS ASSEMBLY CAN BE USED SEPARATELY
Write for Details
M-B PRODUCTS
130 EAST LARNED STREET **DETROIT, MICHIGAN**

GOVRO-NELSON
AUTOMATIC DRILLING UNIT

FAST—COMPACT—CENTRIFUGAL FEED PROTECTS DRILLS—EASILY ATTACHED

Four models—1800 and 3600 synchronous and 5500—12000 R.P.M. Universal Motors.

HOLE ENGINEERING SERVICE
307 Stormfeltz Loveley Bldg., Detroit, Mich.

YOU'LL SAVE TIME

AND TROUBLE . . . BY SPECIFYING NATIONAL TWIST DRILLS, HOBS, REAMERS . . . MILLING CUTTERS, *Special* TOOLS

NATIONAL TWIST DRILL AND TOOL CO.
DETROIT, U. S. A.

Tap and Die Division, WINTER BROS. CO., Wrentham, Mass.
Factory Branches: New York, Chicago, Philadelphia, Cleveland
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USE LAYOUT FLUID

for general machine shop and tool room use on dies, jigs, fixtures, and machined parts. With the use of the die blue layout fluid, you do not have to polish the surface of work. Simply wipe surface fairly clean and brush on.

DRIES INSTANTLY
5 oz. 40c; 1 qt. 90c; 1 gal. $2.50

Dayton Rogers Manufacturing Co.
Minneapolis, Minn.

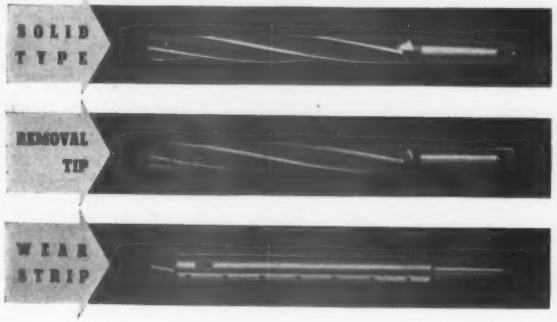
GAMMONS
OF
Manchester

PRODUCTION TOOLS

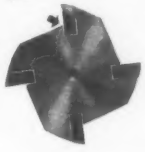
ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOLMAN CO., MANCHESTER, CONNECTICUT

Stellit CORE Drills



THE SCULLY JONES BRAZING PROCESS INSURES UNIFORMITY



These new inserted blade core drills were designed in conjunction with the Haynes-Stellite Company to make possible for you to save one-half the time at one-third the cost.

For further details send your blue prints or requirements to our Engineering Dept.

SCULLY-JONES & COMPANY
1006 SOUTH ROCKWELL STREET — CHICAGO, ILLINOIS

AWAY TO PUSH UP PRODUCTION

FIT THE TAP
TO THE JOB

Tell us your material, tell us your required limits, tell us your tapping conditions and we will supply you with taps specially built to increase YOUR production. Ask to have a "Greenfield" Engineer call.

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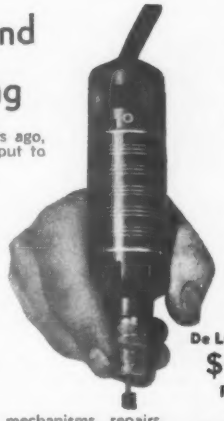

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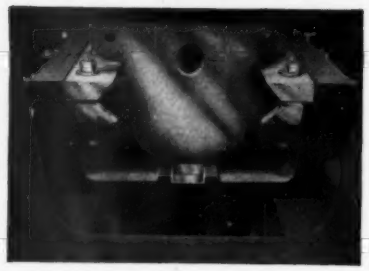

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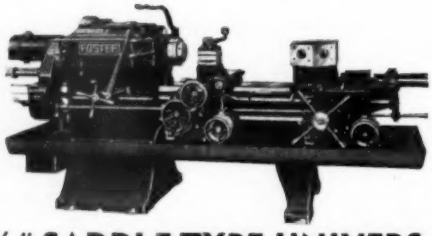

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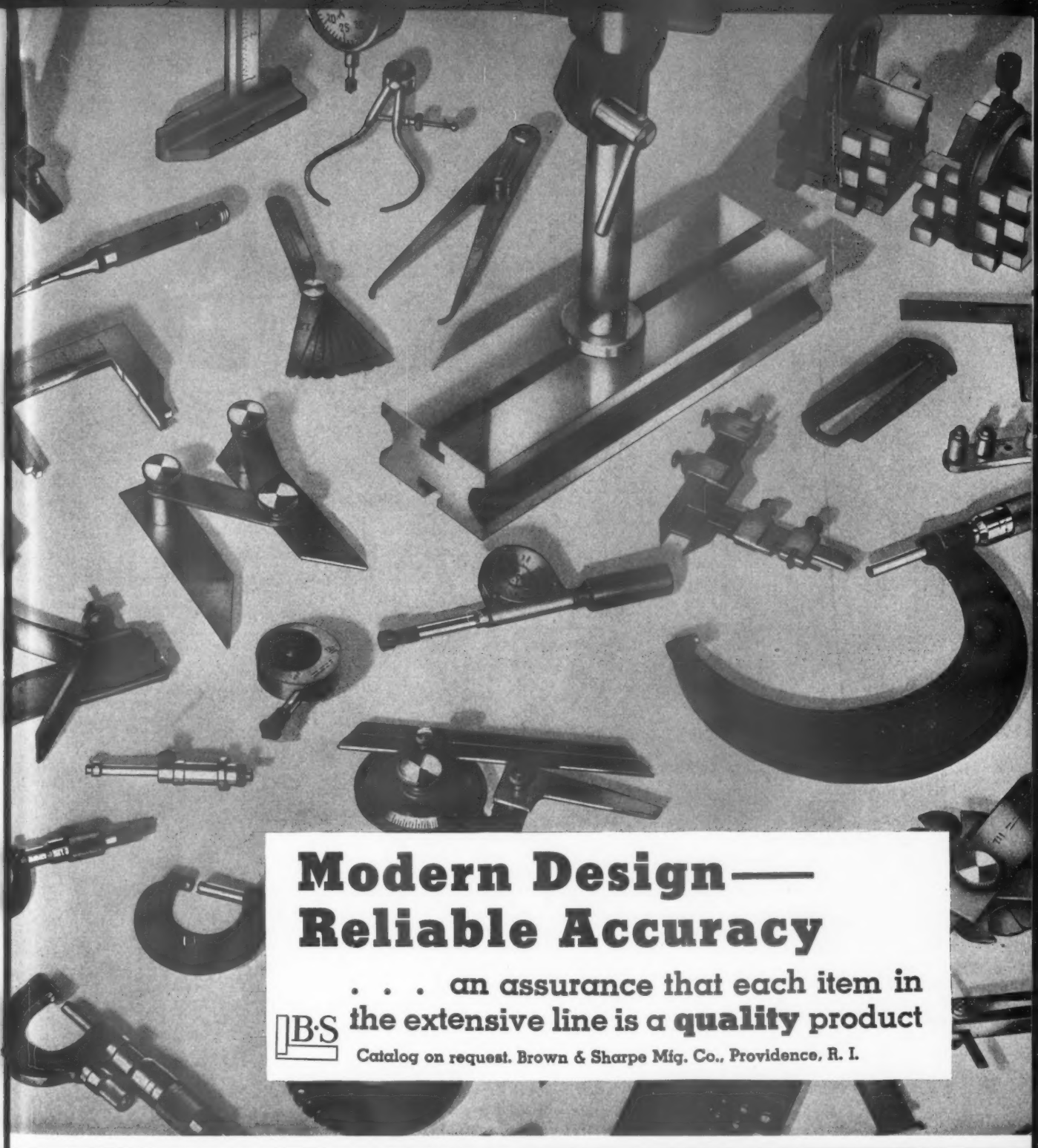

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